MINOR SURGERY

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SECOND EDITION

WITH 475 ILLUSTRATIONS

LONDON
HENRY KIMPTON
263 HIGH HOLBORN, W.C.
1930

Printed in U S. A.

IN MEMORY

of

AGNES H. HERTZLER HUEBERT B.S M.D

OPHTHALMOLOGIST TO THE HALSTEAD HOSPITAL

PREFACE TO SECOND EDITION

This edition remains essentially the same as the previous one with additions and corrections of the text and the addition of thirty seven illustrations

There is a wide difference of opinion as to what should be regarded as minor surgery The chief stress in this book has been placed upon the recognition of lesions while they are yet minor We have been less disposed to enter extensively into description of technic except in those conditions in which this clinic has developed a treatment of its own.

No attempt has been made to include methods not in use in this clinic. Each clinic has its own routine and the end results are in general about the same

As in the previous edition the pathology of disease is not discussed since the object of this book is wholly to aid the dispensary student to understand what he sees in his daily work and to enable him to gain a general perspective of the subject which may be only partly illuminated by his clinical observations.

A. E H.
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Halstead, Kansas.

PREFACE TO FIRST EDITION

This book on minor surgery has been prepared with the idea of helping the dispensary student to understand what he sees in the out patient clinic It is hoped that he may find it useful in his work as interne and as a source of occasional information in general practice

Only those things that have been proved in practice are included. The newer things that have been tried with dubious results have been omitted.

No reference to pathology is included because we had in view wholly a practical end.

A. E. H.
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Halstead, Kansas,
June 25 1927

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MINOR SURGERY

CHAPTER I

SUTURES, SUTURE MATERIAL, DRESSINGS, AND THE TECHNIC OF SUTURING

A very wide latitude is allowable both as to the materials and manner of procedure in surgical operations No attempt can be made to cover all possibilities and those presented here must be regarded merely as some of the ways in which certain indications can be met.

SUTURE MATERIAL AND LIGATURES

Sutures and ligatures are divided into two classes absorbable such as catgut and kangaroo tendon, and nonabsorbable as silk worm gut, horsehair, linen cotton, silk, wire, and composition sutures of various makes. Absorbable sutures are digested and removed by the tissue fluids and these are used when one wishes to bury material in the tissue as in the suturing of muscle or fascia or in the ligating of vessels. Nonabsorbable sutures or ligatures are used in suturing skin, tendons, ligaments nerve sheaths, in uniting broken bones and in ligating very large blood vessels.

Catgut

Catgut is prepared from the intestine of sheep It may be purchased sterile, either plain or chemically treated, or as commercial or raw gut. Unless it is used in large quantities, it is more economical to purchase the gut ready prepared for use The sterile gut of the market is put up dry in envelopes, single strands in tubes or larger amounts in containers The envelopes are convenient when the gut is to be carried about in the surgeon s grip because they cannot be damaged as can the glass tubes For general hospital work the single strand in a glass

tube is more satisfactory because the tube may be immersed in an antiseptic solution, or the product of some makers can be boiled with the instruments.

Catgut appears on the market in sizes ranging from 000 to 6. For nearly all purposes sizes 00 to 2 will be found most practical. Plain 00 is useful in suturing small skin incisions or wounds in which the sutures are not under any great tension and in which a lasting suture is not desired. Plain 0 gut may be used in ligating all small vessels of wounds and in suturing muscle and fascia in small wounds. For large vessels pyoktanin from 0 to 2 gives greater security. Size 2 may be used for ligating all but the large vessels. This size may be depended upon to remain in place from three to five days. It is not of sufficient permanence to warrant its use in fascia as in abdominal incisions, hernias, and the like.

Chromic catgut is gut treated with chromic acid or bichromate of potassium to render it less readily dissolved by the tissues. It may be obtained in three grades as to its absorbability, namely, 10, 20, 30 day catgut.

Chromic 00 catgut is useful in suturing small tendons and nerve sheaths and in gut anastomoses. Size 0 is used in suturing large tendons or in fascias in children or in situations where the tension is not great, as in plastic work on fascia, muscle, etc. Size 2 is used in fascias subject to muscle strain, as the deep abdominal fascia and the fascia covering the muscles of the extremities, hernias, etc.

Horsehair

Horsehair may be had unsterile or sterilized in sealed glass tubes. When unsterile it may be boiled for fifteen minutes before use. Horsehair is the most desirable skin suture for facial wounds or wounds on other exposed surfaces where scarring is to be considered. If so used, the suture should be removed in four days or less to keep it from cutting in and to prevent punctate scars where the sutures pass through the skin. Horsehair has the advantage of being fine, strong, easily seen, and easily removed. It has the disadvantage that it is often brittle, breaking when the knot is being tied.

Kangaroo Tendon

Kangaroo tendon is prepared from the tail tendons of the kangaroo It may be had in fine, medium, and coarse sizes. It is usually chromicized and sold sterilized in sealed glass tubes It is very strong and remains unabsorbed longer than any other absorbable suture It is used principally in bone surgery It has the disadvantage that often it is brittle and untrustworthy

Silkworm Gut

Silkworm gut is a nonabsorbable suture material prepared from the contents of the silk sac of the silkworm It is made in fine, medium, coarse and extra coarse sizes It is a very strong material and deteriorates very little with age It is sterilized by boiling It has a tendency to become brittle after repeated boilings. Silkworm gut is the best all purpose skin suture The fine grades may be used in wounds in which the sutures are not subjected to much tension and in small wounds, while the medium is better for large wounds. The coarser grades are used principally as stay sutures, being placed deeply into the tissues to take the tension off the other sutures.

Silk

Silk tests the aseptic technic of the operator Many skilled surgeons use it for many purposes, ligation of vessels sutures of fascia as well as in gut tendon and blood vessel sutures It is the most scientific suture to use for it alone may be depended on to actually serve the purpose for which it is used Its drawback is that unless thoroughly sterile the tissues become infected and a discharging sinus results which remains until the offending material is removed.

Silk may be used in various sizes either white or black the so-called iron-dyed Silk must be thoroughly sterilized by prolonged boiling or in the autoclave. It must be wrapped on spools, but the spool should not contain too many layers lest sterilization be interfered with It tends to become fragile after repeated sterilization, hence no more than is likely to be used at once should be sterilized. The mistake usually made in the use of silk is that sizes far too large are used. The very finest ob-

tainable must be used for vessel, nerve, and tendon suture. Very fine is sufficient for ligation and fascial suture Only in the ligation of large vessels are the larger sizes advisable and here not because the smaller sizes are not sufficiently strong but because the thin strands tend to cut the walls of the vessels.

Linen

Linen has most of the good points and also most of the disadvantages of silk. It is prepared in the same manner and is used for the same purpose

Celluloid Yarn

Pagenstecher's linen, or celluloid yarn is a linen impregnated with celluloid When properly made, it is useful in intestinal anastomoses, but most samples obtainable on the market are thick and fuzzy and have all the disadvantages of silk without its excellent points.

Composition Sutures

There are various nonabsorbable sutures called "dermal sutures" which are used as the name implies for closing skin incisions or wounds. They are sold sterilized in paper envelopes in fine, medium and coarse sizes. They are pliable possess great tensile strength and are easily visible because of their blue color The fine dermal suture is an especially good one to use in closing wounds of the face or in any place where the minimum scar is desirable. The smaller sizes have all the advantages of horsehair and are much less brittle.

Wire

Wire made of silver or an aluminum bronze composition is used in bone surgery and is sterilized by boiling If wounds in which it is used heal without infection it may be allowed to remain in the tissues. If the wound becomes infected, the wire must be removed

The Removal of Sutures

Nonabsorbable sutures communicating with the surface must be removed Those used for the coaptation of the skin in exposed surfaces as in the face or neck, should be removed in from

two to four days in order to prevent the formation of scars at the suture points Skin sutures in unexposed parts are allowed to remain until the time of the first dressing, usually a week after the operation Retention sutures may be allowed to remain for ten to twenty days. Should they cut into the tissues, either be cause of too great tension or because of infection, they must be removed as soon as they no longer perform their function.

SURGICAL DRESSINGS

Surgical dressings are used primarily for protection against the environment, the clothing bedclothes, etc. If not in contact with foreign objects, wounds heal more quickly when exposed to the air Dried serum forms a scab which is the best protection against infection. Since we must protect the wounds from con tact with the environment or critical persons, who know nothing about the processes of wound healing, we cover them with mate rials called "dressings."

Cotton

Absorbent cotton is most commonly used as dressing, and it is so called because the fat has been abstracted from it so that it may absorb fluids with greater facility It may be purchased sterilized in ½ ounce to 1 pound cartons, or unsterile in one pound rolls, or in large bales for hospital use It is used in the making of wound dressings to reinforce the gauze dressings placed directly over a wound and as padding for splints or casts. It should not be used in direct contact with a wound on account of its tendency to stick and pieces to detach and work down into the wound. A convenient wound dressing is made by covering a layer of cotton large enough to completely cover the wound with a single layer of gauze. The thick layers of cotton usually placed over clean wounds are unnecessary and serve no purpose except in some manner to furnish pleasure to the intern and despair to the hospital superintendent. If copious drainage is present this dressing may be reinforced by covering it with a large piece of cotton not covered with gauze. The first dressing should be held by a few adhesive strips and the reinforcing cot ton by a binder or a gauze bandage

A good grade of quilting cotton may be purchased at any dry

goods store at much less than the cost of absorbent cotton This is not so good as absorbent cotton for draining wounds but may be used in making dressings or padding Cotton is far inferior to gauze as a sponge during operation All cotton is sterilized by steam under pressure

Cellulocotton

Cellulocotton is a paper composition product which has great absorptive capacity and is a cheap substitute for absorbent cotton for wounds with copious drainage It is fluffy and a small amount in weight makes a huge pile, providing delight to the intern at a small cost.

Gauze

Surgical gauze is a loosely woven cotton material graded according to the number of strands to the inch, 20x24 being a commonly used grade. It is used for making pads for sponging the wounds during operations, for abdominal pads for keeping hollow viscera out of the operative field and for covering wounds after the operation has been completed

Gauze sponges may be purchased sterilized in paper envelopes or cartons or it may be had unsterile in 25 50 and 100 yard rolls. The gauze in the unsterile rolls is one yard wide and folded once Gauge sponges may be made from the rolled gauze by cutting it into squares about 9 inches on a side, folding in the cut edges and folding this to make a square pad about 4x4 inches and several layers in thickness These are a convenient size to use as sponges during operation or as dressings for the wound after operation is completed Gauze is best sterilized by steam under pressure, or in an emergency gauze may be boiled in water and dried in an oven.

Sterile gauze strips ½ to 2 inches wide and 3 to 5 yards long may be purchased in sealed glass tubes. These are used for packing of wounds and pieces of them are used for small drains.

For packing and drains gauze is sometimes impregnated with a chemical notably iodoform subiodide of bismuth or plain subnitrate of bismuth. The advantage of these is that they act as foreign bodies in the tissues, causing a rapid coagulation of lymph about them thus walling off quickly the area occupied by

the gauze This is of advantage when hemorrhage is to be stopped or the environment is to be protected from infection

Iodoform Gauze

Iodoform gauze is gauze which has been soaked in a 5 to 10 per cent solution of iodoform in alcohol and glycerin and then dried It may be made or purchased sterile in glass jars or in the form of strips in sealed glass tubes Subiodide of bismuth gauze is made in the same way It has the advantage of being odorless, a notable objection to the use of iodoform gauze.

BANDAGES

Bandages are materials used to retain dressings or splints to the body or to compress certain parts A variety of materials are used.

Gauze Bandages

Gauze bandages may be purchased sterile or unsterile in various widths or gauze may be secured in a yard roll and the bandages cut any desired width. Sterile bandages are practically never necessary

Elastic Bandages

Elastic bandages are made of cotton or silk with strands of rubber woven into the fabric. The most practical one in use today, however is a cotton bandage so woven as to give it almost as much elasticity as those containing rubber and possessing the advantages of cheapness and the fact that they may be washed without deteriorating rapidly They are used chiefly to bandage legs with large varicose veins or recently injured joints

Rubber Bandages

Bandages made of pure rubber are sometimes used to make gentle constant pressure over diseased parts They have the disadvantage of being impervious to fluids, hence the skin which they cover soon becomes macerated.

Muslin

Muslin is used principally for the making of binders. These are used to hold dressings on very large wounds or to hold reinforcing dressing on wounds with a large amount of drainage Muslin is a much stronger material than gauze and is sometimes used for bandages when a stronger bandage is deemed necessary

√PROTECTIVES

Rubber Dam, Oiled Silk, or Oiled Paper is used principally to cover moist dressings to prevent too rapid evaporation. Rubber dam, which is pure gum rubber in the form of thin sheets, is used to protect wounds against contamination by excretions of the body as wounds about the pelvis or lower extremities in babies or young children. Strips of rubber dam are frequently used to cover a wound after skin grafting to prevent the dressings, if any are used, from sticking to the grafts. It is sometimes used in burns to prevent the gauze from pulling off the newly formed epithelium

Wire Screen

Wire screen is useful as a covering for wounds which are to be exposed to air and sunlight, such as ulcers caused by burns or wounds which have been covered with Thiersch grafts The screen is fitted in such a way that it stands away from the surface of the wound The edges are padded and the screen is held in place by adhesive strips

DRAINAGE MATERIAL

Drainage is employed to prevent the healing of a wound so that the secretions lying more deeply may escape To a less extent they furnish a direct avenue for the escape of such deeply lying fluids. Nonabsorbable material has been chiefly used

Rubber Tubing

Pure gum is used for making the best drainage tubes. Sizes ranging from those with a lumen from 1/16 to 5/8 of an inch in diameter will meet all requirements The smaller sizes are use

in draining small abscesses. Most surgeons use rubber tubes for the purpose of draining clean wounds in which blood and serum are likely to collect. Rubber tubing is also used for deeply lying hollow viscera as the gall bladder and urinary bladder. The larger sizes are used for correspondingly larger abscesses. Openings made along the sides of drainage tubes facilitate drainage. In case of small wounds a tube may be split longitudinally and a piece inserted to lead the fluid to the surface. All rubber drains are sterilized by boiling.

Gauze

Gauze is used as temporary drainage material. After twelve to eighteen hours the gauze becomes saturated with exudate and becomes a plug and drainage is hindered rather than facilitated. It is often used to wall off an area against infection or to control by pressure a hemorrhage not accessible to ligature. It has the disadvantage of sticking to the wound and being harder to remove than rubber, although if the gauze is impregnated with vaseline this difficulty is obviated. It is useful in draining small abscesses or tissue spaces where a collection of serum or blood is feared. It is often used in conjunction with rubber drains to hold the wound open and thus make a larger opening for drainage when removed. An ordinary operating sponge may be rolled and used as a drain, or gauze strips sterilized in sealed glass tubes may be obtained.

Gutta Percha or Rubber Dam

Sheet rubber makes excellent drainage material. It is sterilized by boiling or by immersion in alcohol, phenol, or formalin and rolled in tubular form. It does not stick to the wound and allows drainage around and through it. It is useful in draining small wounds or wounds in which a serous or bloody drainage is anticipated, but it should not be substituted for rubber tubing where thick pus is to be drained. Care must be taken not to so twist the drainage material about the various parts of the wound that pieces are torn off in its removal. If this is done a sinus may persist.

Cigarette Drain

A cigarette drain is a piece of gauze rolled in sheet rubber. The rubber tissue prevents the gauze from sticking to the wound and permits drainage around it. It has no particular advantage over other forms of drainage and is not so efficient as rubber tubing.

Silkworm and Horsehair

Several strands of silkworm or horsehair are sometimes used to drain the secretions from small aseptic wounds.

STERILIZATION OF MATERIALS

When one has access to the sterilizing equipment of a hospital, it is an easy matter to have an operating pack containing towels, sheets, sponges, gown and wound dressings made up and sterilized under steam pressure in the autoclave. A small steam pressure sterilizer for office use is now made in which textiles may be sterilized when wrapped in small bundles. This sterilizer is heated by a Bunsen burner or a gas or coal oil burner.

Operating packs may be made up and sterilized every few weeks, if they are not used, thus keeping them ready for emergency. Instruments, drainage material, and rubber gloves may be sterilized by boiling, or the latter may be autoclaved and put on dry. Sutures and ligatures may be purchased already sterilized.

For countless physicians, however, a hospital autoclave is not available and these by the use of improvised methods can perform aseptically any operation in minor surgery. An operating pack containing all the textile materials necessary for an operation may be made up wrapping them loosely in a sheet. This may be boiled in an ordinary wash boiler on a cook stove, the water drained off and the pack dried in the oven. The oven door should be left ajar to allow the steam to escape, the fire kept at low heat and the pack watched to keep it from scorching. Even though the material is a little damp it does no harm.

An ordinary steam pressure cooker now found in many households answers all the purposes of a hospital autoclave except that the material must be wrapped in smaller bundles for sterilization

Improvised Emergency Instruments and Materials

One of our noted American surgeons frequently told his classes that they could perform an operation for acute osteomyelitis with a pocket knife two table forks with the tines bent at right angles to serve as retractors, and an ordinary gimlet purchased at a hardware store This distinguished surgeon was too extravagant the forks are not needed By the exercise of a little ingenuity any physician in an emergency can do good work with little material at hand Ordinary sewing needles may be used in lieu of surgical needles. They may be heated and bent into curved needles or the points ground into cutting needles. Cotton linen, or silk thread found in every home may be boiled and used as suture material. Small pliers may be used as needle holders and to catch vessels for immediate ligation. A small hammer and carpenter s wood chisel or a gimlet may be used to open an infected bone A sharp pocket knife or a razor may be used as the cutting instrument. Bed sheets may be used in which to wrap the bundle to be sterilized and to drape the patient or torn and made into operating sponges and drains A piece of rubber glove may also be used as a drain. Face towels may be used as operating towels and quilting cotton in the place of absorbent cotton. Many other makeshifts will no doubt suggest themselves. Improvised instruments and materials are just as effectually sterilized as the regulation material and much good work can be done with them

CLOSURE OF WOUNDS

Whether wounds are closed or left open depends upon whether they are clean or infected Clean wounds are usually entirely closed without drainage except in cases in which, as after the removal of a tumor a cavity cannot be entirely obliterated and drainage is instituted to prevent the accumulation of a blood clot liquefied fat or serum. Infected wounds are either left entirely open or are only partially closed.

In an accidental wound in which infection is always a probability no nonabsorbable material and as little catgut as is necessary should be buried. In closing a wound completely whether intentionally or accidentally made the various tissues should be replaced and held in as nearly their natural

position as possible. Muscles cut across or split should be sutured, the sutures being loosely tied in order that they do not cut through the muscle or strangulate its circulation Deep fascias should be closely approximated or better still, over lapped a little, as good union is very important. Superficial fascias should be closely approximated in order that dead spaces do not occur in the tissue after closure. If this entails the burying of too much catgut, the widely placed tension sutures of the skin may include some of the tissues below and prevent a dead space from occurring Cutting needles are used in suturing the skin and some of the thick fascias and tendons while round needles are better in the softer tissues.

Tying of Knots

There are three types of knots used in surgical technic the granny the reef and the surgical The granny is the knot ordinarily employed in which the terminal ends lie at right angles to each other In the reef knot the terminal ends lie parallel The surgical knot is a double reef knot The advantage of the surgical knot is that the first loop is less likely to slip while the second is being tied It has the disadvantage that the loop does not close down firmly especially when a small structure is being ligated The granny knot is preferable when soft pliable catgut is used because the knot is less apt to slip when the catgut begins to swell and soften as it becomes bathed in tissue fluids In catgut a third knot should be used to prevent loosening Catgut must be tied firmly with a prolonged steady pull in order that the elasticity of the gut allows it to pull tightly through the knot A few of the common sutures may be mentioned

Continuous Suture

The simplest form of suture begins by passing the needle through one edge of the wound and out the other and then tying a simple knot. The edges of the wound are then pierced successively until the end is reached (Fig 1 *A*) and a terminal knot is then tied This is done by putting the loose end through the needle so that this may be tied with the double thread through the needle (Fig 1 *B*) When this is tied the suture is complete

Interrupted Suture

At intervals of ¼ to ½ inch, depending upon the thickness of the skin sutures are passed through the skin through the

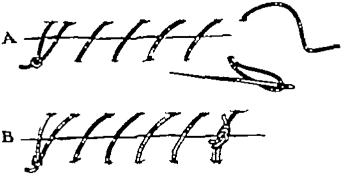


FIG. 1—Continuous suture *A*, Shows the sutures passed ready for tying. *B* Shows the knot tied.

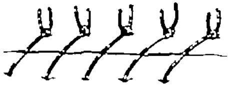


FIG 2.—Interrupted suture The knot is placed to one side of the line of the wound.

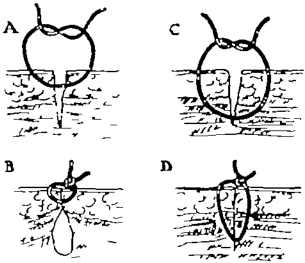


FIG. 3 —Interrupted suture *A*, improperly placed, leaving a cavity *B* properly placed suture, *C* closing wound without cavity *D*

underlying tissues, and through the skin again at an equal distance from the wound edge (Fig 2) The knot is tied over the skin at one or the other side of the wound in order that the knot

shall not press directly on the wound It is important that the suture shall pass deeply enough to bring the severed tissues into apposition. If in a deep wound, the suture passes through the skin only (Fig 3 *A*), when the knot is tied a cavity remains (Fig 3-*B*) On the other hand, if the suture is passed into the tissues to the depth of the wound (Fig 3-*C*) when the suture is tied no cavity remains (Fig 3 *D*)

Looped Suture

When there are important structures in the depth of the wound that require accurate coaptation, as the rectus fascia in wounds of the abdominal wall, sutures are passed in such a manner that a separate loop includes the fascia This suture passes through

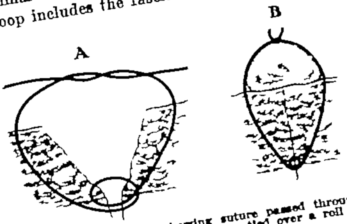


Fig. 4—Looped deep suture. *A* showing suture passed through fatty layer looping about the facial layer *B* suture tied over a roll of gauze.

the entire thickness of the wound (Fig 4-*A*) but instead of passing through the entire thickness of the wound on the opposite side, it passes through the fascia only, then passing through the fascia of the opposite side sweeps below it then through the entire thickness of the wound on the opposite side When the suture is tied a small loop holds the fascia in close apposition (Fig 4-*B*) In order to prevent the suture from cutting into the skin a roll of gauze is placed over the wound and the sutures are knotted over it

Mattress Suture

A mattress suture may be either continuous or interrupted and is used both as buried sutures and in the skin. It has the advantage of not cutting through the tissues as readily as a

single interrupted suture and is therefore useful in approximating the cut edges of muscles and skin or any tissues subject to tension. Exact approximation of skin edges is more easily attained with a mattress suture, making it the suture of choice where cosmetic results are important. In placing a mattress suture in the skin a straight cutting needle should be used and

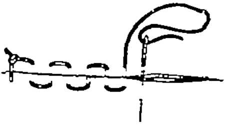


Fig. 5.—Continuous mattress suture.

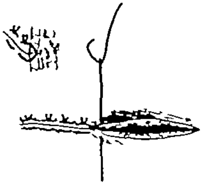


Fig. 6.—Mattress suture for the skin. Insert shows the suture penetrating the lower surface of the skin.

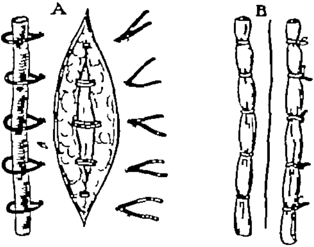


Fig. 7.—Bolster suture. A rubber tube, A, or a roll of gauze, B, is tied in the suture to prevent cutting of the skin by the suture.

the needle held in such a position that it makes only a small angle with the surface of the skin while going through it (Fig. 5). If the needle pierces the skin at right angles, the cut edges are turned out and lie side by side after the suture is tied. A fine interrupted mattress suture (Fig. 6) is well suited for uniting skin where the minimum scar is desired as in wounds of the face and neck.

Bolster Suture

The bolster suture is a modification of the continuous mattress suture. It differs from it in that a roll of gauze or a rubber tube is slipped through the loops of the mattress suture on each side of the line of incision and the material drawn taut and tied over them (Fig 7) It is useful in closing skin under tension as the gauze or rubber helps prevent the suture from cutting in

Button Suture

The button suture is a modification of the interrupted mattress suture in that the suture is run through a button (Fig 8) on each side of the incision and the knot is drawn down tightly on the one on the side of the loose ends of the suture This is useful as a tension suture where the bolster suture would be too cumbersome as, for example as a tension suture in the repair of a harelip

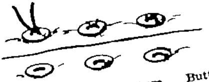


Fig. 8 —Button suture. Button are used to prevent cutting of the skin by the suture.



Fig. 9 —Interlocking continuous suture

Locking

The chain suture is used by some as a skin-closing suture It has no particular advantage over the mattress or plain continuous suture except that it is more quickly placed than the mattress and coapts the edges more accurately than the simple continuous (Fig 9)

Tension Suture

The tension suture is used where there is wide gaping of the wound Its purpose is to distribute the pull on the suture to as many points as possible It may be placed in a variety of ways. As good as any is to pass the needle an inch or more from the edge of the wound (Fig 10) coming out near the edge of the

wound on the opposite side It then passes through the skin on the other edge and makes a wide sweep coming through the skin an inch or more from the edge of the wound The result is that when the suture is tied traction is made at four points instead of at two as in the simple interrupted suture

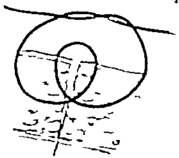


Fig. 10 —Tension suture distributes tension to four points

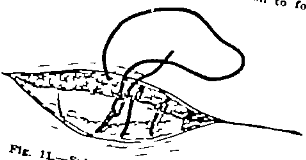


Fig. 11.—Subcuticular suture being placed.

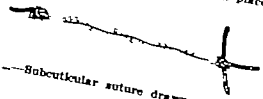


Fig. 12.—Subcuticular suture drawn tight and tied.

Subcuticular Suture

A subcuticular suture is a continuous mattress suture placed just beneath the skin, or in the skin but not piercing the surface At the beginning the suture pierces the skin from the outside a short distance from the end of the incision (Fig 11) and emerges from the skin about the same distance from the other end of the incision The suture material is then grasped at each end and pulled taut approximating the skin edges (Fig 12) It may be left untied or a knot may be placed at each end

close to the skin. Fine chromic gut, as 00, may be used or some nonabsorbable material may be selected It should only be used in wounds in which a separate closure of the superficial fascia has been made or where there is very little tension on the suture

Special Suture

Special types of wounds require modified sutures A few only need be mentioned here.



Fig. 13—Mattress suture of muscle

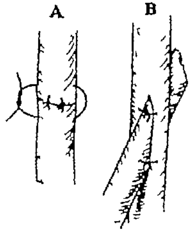


Fig. 14—Suture of tendons *A*, end to end *B* suturing severed end into neighboring intact tendon.

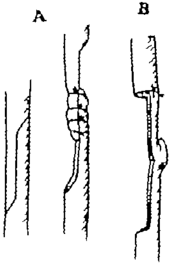


Fig. 15.—Lengthening tendon *A* by splitting and sliding *B* by splitting one end and turning it downward

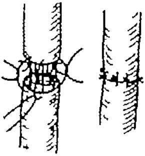


Fig. 16—Suture of nerves. Numerous fine sutures are passed through the nerve sheaths only

Suture of Muscles

Muscle tissue being very easily torn by sutures, such methods must be used as will include as much tissue as possible Relatively heavy sutures applied in some form of mattress suture are satisfactory (Fig 13)

Suture of Tendons

When tendons are severed they may be united by fine sutures passing through the substance of the tendon or through its edges only, depending upon the difficulty in maintaining apposition (Fig 14-*A*) When one end of the tendon is completely lost the remaining end of the tendon may be drawn into a split of an unsevered tendon and fastened by means of sutures (Fig 14-*B*) When a tendon is to be lengthened it may be split and the half tendons slid over each other and the ends sutured (Fig 15-*A*) or one end only is split, folded and united to the other free end (Fig 15 *B*)

Suture of Nerves

Nerve ends must be joined much more gently by sutures than tendons The nerve sheath only should be united by sutures of very fine silk. As many as needed to secure coaptation of the severed nerve ends should be used (Fig 16)

CHAPTER II

BANDAGING

It is not the purpose of this chapter to describe the countless ways in which bandages may be applied but only to mention those which are in the most common use There is something more to bandaging than just wrapping a string about a limb The surgeon often receives his first impression of a new assistant by the manner in which he applies the bandage. If it is neatly and correctly applied it indicates a correct and orderly mind while a slovenly applied bandage suggests inherent carelessness the supreme defect in a candidate for advancement

Bandages are used to retain dressings on wounds, to hold splints in position to apply pressure where this is needed, as in the checking of hemorrhage and to support parts of the body

Roller Bandages

The roller bandage is the type of bandage in common use. It consists of gauze muslin flannel rubber or gauze or crinoline cloth impregnated with plaster of Paris. The material is wound into firm rolls and is cut in widths of from one to six inches The one to three-inch widths are the ones most frequently used The gauze roller is the one used most frequently to hold dressings on wounds muslin to retain splints while flannel or rubber is used where an elastic supporting bandage is desired, as in varicose veins of the leg All of these bandage materials may be purchased in yard width, and the bandages made by hand, but they can be obtained cut and sterilized at prices which almost preclude making them

If bandages are not already rolled a bandage roller is available in most hospitals. The surgeon, however should know the proper method of rolling a bandage The following method is approved The gauze strip is folded at one end including about a foot of the bandage A few turns are made with this in order to form the beginning of the roll This miniature roll is then

grasped between the thumb index and middle fingers of the right hand while the thumb, index and middle fingers of the left hand smooth the bandage (Fig 17) By rotating the bandage from left to right it is gradually fed about the roll

Tailed Bandages

Tailed bandages are so called because they consist of gauze or muslin so cut as to possess three or more extremities to be

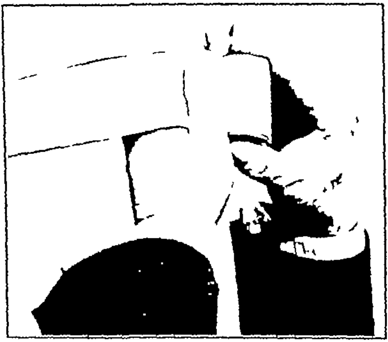


Fig. 17—Proper method of grasping a bandage while rolling it.

tied or pinned in applying the bandage They are very useful on parts of the body which either by their form or motion do not lend themselves to being covered by a roller bandage

Binders

Where broad surfaces are to be bandaged, it is more convenient to apply a single broad strip of cloth. These are called binders. They are used about the chest and abdomen They are fastened by means of safety pins. The advantage of the binder consists in its ease of application and its adjustability to the part to which it is applied In order to retain it in place, secondary strips are attached The chest binder is anchored

by pinning strips of muslin over the shoulders like suspenders. Abdominal binders are held in place by passing a bandage beneath the perineum (Fig 18) This addition serves also to hold any dressing that may be applied to the perineum.

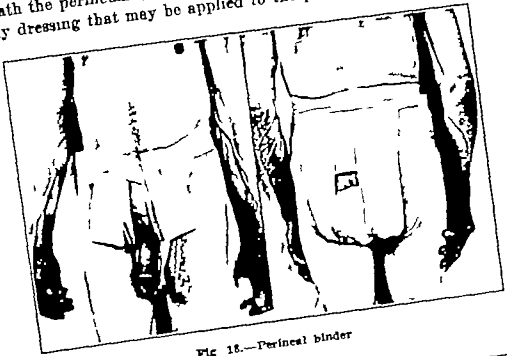


Fig 18.—Perineal binder

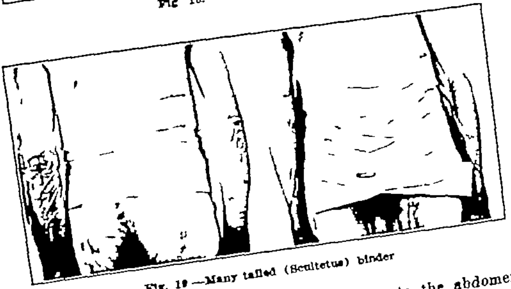


Fig. 19 —Many tailed (Scultetus) binder

The many tailed binder adapts itself better to the abdomen than the simple binder (Fig 19) The perineal binder may be attached to an abdominal binder or to a simple bandage about the abdomen (Fig 18)

Application of Roller Bandages

A roller bandage should always be applied with its external surface toward the skin. In handing a bandage to the surgeon, care should be taken that it is in this position with a foot of the bandage unwound so as to be ready for immediate application without the necessity of searching for a loose end (Fig 20) The beginning of the bandage is held down by the fingers of the left hand while the right hand carries it around the part to be bandaged to the starting point, thus anchoring the bandage It is then usually applied by alternating the bandage from the right to the left hand

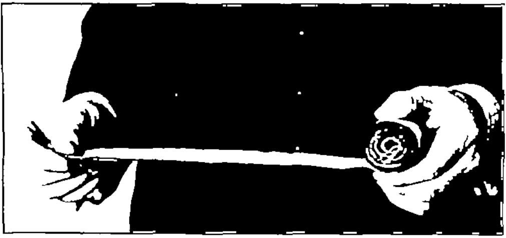


Fig. 20 —Correct manner of holding a bandage before beginning its application.

The bandage should lie snugly against the part and each turn overlap the one above or below it When completed several circular turns are taken to secure the loose end until it can be fastened by adhesive pinning or by splitting the end and tying

Types of Bandaging

All of the bandages used in minor surgery may be classed under a few fundamental types or are modifications or combinations of these types.

The Circular Bandage is applied in such manner that each turn of the bandage covers the one previously made (Fig 21) It is used to cover small wounds in almost cylindrical parts It

is used most frequently in wounds of the forehead, neck, and parts of the extremities

The Spiral Bandage is applied the same as the circular bandage except that it encircles the part in a spiral manner, each turn passing higher or lower than the previous one and overlapping it (Fig 22) If a dressing is to be very loosely applied, the turns need not overlap but there may be an open space between them constituting the so-called rapid spiral bandage. The spiral bandage is applied to cylindrical parts like the trunk and extremities



Fig. 21 —A circular bandage.

The Spiral Reverse Bandage —In bandaging the more conical shaped parts of extremities a simple spiral bandage cannot be made to lie snugly in contact with the part and not be displaced In order to accomplish this it is necessary to change the direction of the bandage at frequent intervals. This is done by turning the bandage over each time it encircles the part (Fig 23) The bandage should be started at the small end of the cone and the reverse should be made after each complete turn so that they fall in approximately a straight line on the part When

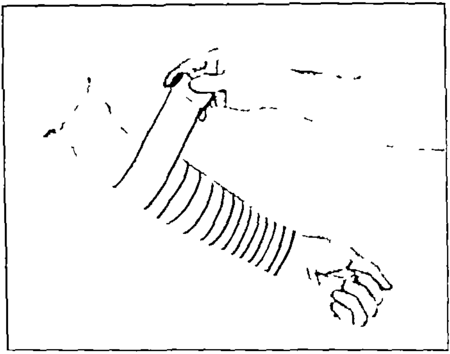


Fig. —Simple spiral bandage.

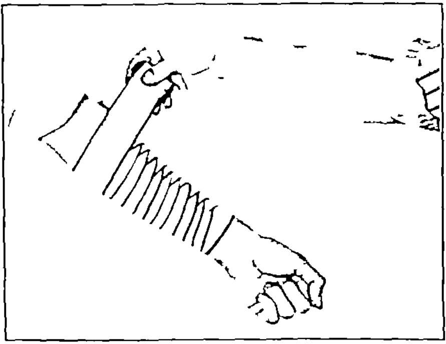


Fig. 23.—Spiral reverse bandage.

done in this manner the reverse is always made toward the small end of the part to be bandaged If a cylindrical part is reached the bandage may be continued as an ordinary spiral

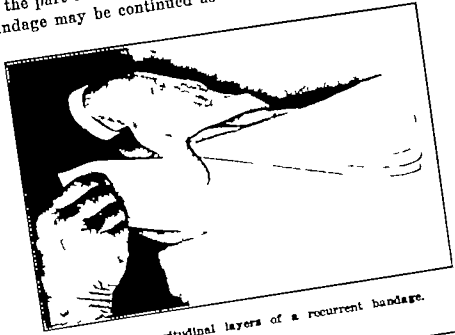


Fig 24 —Longitudinal layers of a recurrent bandage.

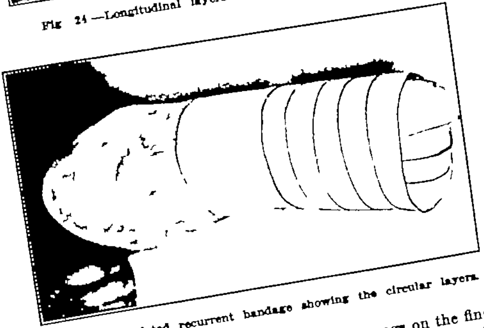


Fig. 25 —Completed recurrent bandage showing the circular layers.

The Recurrent Bandage is used to hold dressings on the finger toes, hand foot or on amputation stumps. It is also used to secure dressings on the top of the head The first turn is a cir cular one made up a short distance above the end to be ban

daged to anchor the beginning of the bandage A reverse is then made and the bandage is carried forward and backward over the end to be covered, the loops as each reverse is made being held by the fingers of the left hand (Fig 24) When the end of the part is covered the bandage is again turned in a circular direction and a few circular turns are then made over the loops of the bandage covering the end of the extremity (Fig 25)

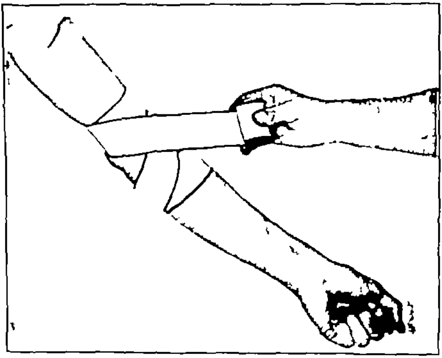


Fig. 26 —The figure-of-eight bandage.

The Figure-of Eight Bandage, as the name implies consists of two loops made around a part in the form of a figure eight (Fig 26) It may be used in combination with the ordinary spiral in bandaging a conical part or in covering joints such as the elbow and knee When used for the latter purpose, it does not become loose like the spiral bandage and still permits motion in the joint When used in bandaging a large and a small part like the chest and the upper extremity or the pelvis and the lower extremity it is called a spica bandage

The Knotted Bandage is used principally about the head. It is made with a double roller The middle of the bandage is

placed in contact with the injured part and the rollers are carried around to the opposite side of the part where they are turned at right angles to each other forming a cross or knot (Fig 27) The bandages are then carried around the part in a plane at right angles to the first making a knot and changing their direction wherever the rollers cross

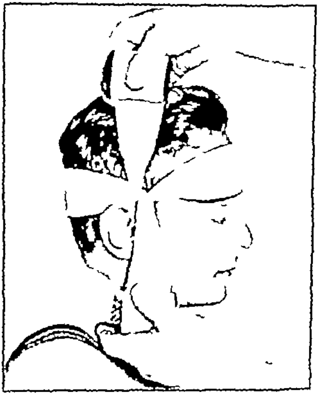


Fig 27 —The knotted bandage as applied to the head.

Special Bandages

The foregoing shows in principle the chief varieties of bandages The various regions of the body present such a variety of problems however that it is necessary to study the kinds best suited to each region

Bandages of the Head and Neck.—The contour of the head makes the application of a bandage that will stay in place particularly difficult The bandaging of this region more than any other is deserving of special consideration

Double Recurrent Bandage of the Head is made with two bandages of different widths having their ends sewed together

Either one and a half and two or a two and three inch bandage should be used depending on the size of the head The wide bandage is started at the occiput and carried forward to the forehead The narrow bandage is carried horizontally around the head *just above the ears and covers the wide bandage at* the forehead The wide bandage is then passed back to the occiput either to one side or the other of the midline of the skull overlapping the first turn The narrow bandage is carried on around the head covering the second turn of the wide bandage at the occiput The wide bandage is then passed forward and

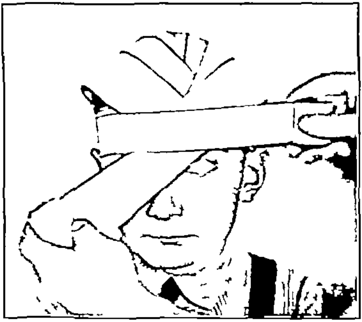


Fig 1.—Double recurrent bandage for the head.

backward over the head, being held down anteriorly and posteriorly by the circular turns of the narrow bandage until the head is completely covered (Fig 28)

The scalp may also be covered by the ordinary single roller recurrent bandage as is used over amputation stumps but the movements of the head make this dressing more easily loosened and displaced than the foregoing

The Circular Head Bandage lies across the forehead above both ears and across the occiput It will hold a dressing anywhere in this area and considerable pressure may be applied with this bandage in case of hemorrhage in the area covered by

it. It is started on the forehead and carried entirely around the head just above the ears (Fig 21) Each layer of the bandage overlies exactly the preceding layer except over the occiput where they are made to overlap and catch below the occipital protuberance This arrangement posteriorly makes it more difficult to displace In case the edges of this bandage show too much slack, this may be taken out by giving it a half turn over each ear as it is carried around the head A two-inch bandage is the one most commonly used

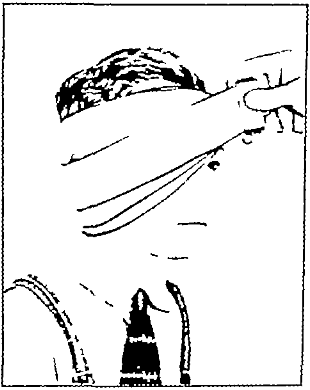


Fig. 22 —Figure-of-eight bandage for one eye.

Figure-of Eight Bandage for One Eye.—A one and a half or two-inch bandage is most suitable This bandage is used to retain dressings over the eye To cover, let us say the right eye the bandage is started on the forehead carried around to the left just above the ear and around the occiput over the right ear to the place of beginning anchoring the bandage. It is then carried around to the left below the occiput and right ear covering the right eye and coming back up to the middle of the forehead One complete circular turn above the ear is then

made to fix this The preceding maneuvers are then repeated, the loops covering the eye overlapping the preceding one until the eye and all but the tip of the ear are covered (Fig 29) A complete circular turn is made after each one covering the eye This circular turn may be drawn tight, but those covering the eye should not exert pressure A piece of cotton inserted be hind the ear before bandaging often adds to the comfort of this member

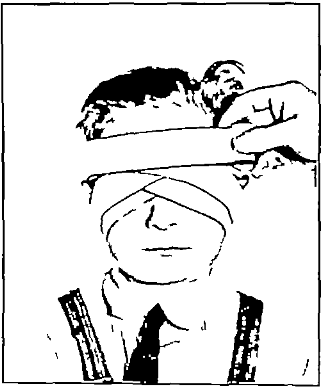


Fig 30 —Figure-of-eight bandage for both eyes

Figure-of Eight Bandage of Both Eyes—A one and a half or two-inch bandage is used. This bandage is used to hold dressings over both eyes and to protect them from light The band age is started on the forehead carried horizontally around above the left ear and around the occiput, then over the right ear to the place of beginning It is then carried around the occiput, under the right ear over the right eye and back to the forehead. It is then continued around over the left ear and the occiput and over the right ear to the forehead. From here it is contin ued over the left eye and cheek, under the left ear and back up

to the occiput It is then carried entirely around the head and then a second lap is made on the right side as at first The right and left eye are alternately covered until sufficient bandage has been applied (Fig 30) The tips of the ears may be left exposed or cotton may be placed back of them and the ears entirely covered

Barton s Bandage—For the Barton bandage a two-inch bandage is used It is usually used to hold temporarily fractures of

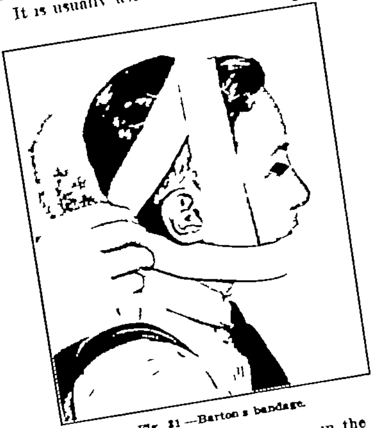


Fig. 31 —Barton s bandage.

the jaw It may be used to hold dressings in the area covered by it but it is somewhat cumbersome for this purpose.

The bandage starts over the occiput and passes over the right parietal bone to the middle of the vertex From there it passes downward on the left side in front of the ear under the chin and upward in front of the right ear to the vertex It then passes around the occiput to the place of beginning From here it is carried horizontally forward under the right ear across the point of the chin and around under the left ear to the place of beginning (Fig 31)

Figure-of Eight Bandage of Occiput and Jaw—A two-inch bandage is used This bandage is somewhat like the Barton bandage but is better suited to hold dressings It does not have the turns over the point of the chin and uses circular turns around the neck to fix the bandage

This bandage is started on the back of the neck and is carried twice about the neck to anchor the bandage It is then carried upward along the right side of the occiput, over the



Fig. 32.—Figure-of-eight bandage of occiput and jaw

parietal bone to the vertex thence down the left side in front of the ear under the chin and up the right side of the head in front of the ear to the vertex Here it crosses the other loop and continues downward under the occiput to the place of beginning (Fig 32) One circular turn is then taken around the neck to fix the posterior loop and the process is repeated as before The loops around the neck prevent the slipping upward and displacement of the turns about the occiput.

Figure-of Eight Bandage of Head and Neck.—A two-inch bandage is used Where the wound is high on the neck, a circular bandage often slips down and exposes the wound. In such cases a figure of eight of the head and neck is better

This bandage is applied by making one circular turn about the neck starting at the front and carrying it around posteriorly It is then carried over the top of the head passing in



Fig. 33 —Figure-of-eight bandage of head and neck.

front of the ear on one side and behind it on the other (Fig 33) or it may descend in front of the ear on the opposite side.

Figure-of Eight Bandage of the Neck and Chest.—A two-inch bandage is used This bandage is used for wounds so low on the neck that a circular bandage slips up exposing the wound It may also be used to hold dressings on the chest or back or in the axilla

It may be started on the right side of the neck, and carried forward for one complete turn about the neck. It then descends across the left side of the chest passing across the left axilla and upward over the left scapula to the place of begin

one circular turn around the chest from left to right passing just under the arms to the place of beginning It is then carried downward as a plain spiral to the rib margin or down to the symphysis if it is so desired (Fig 35) It may start in the

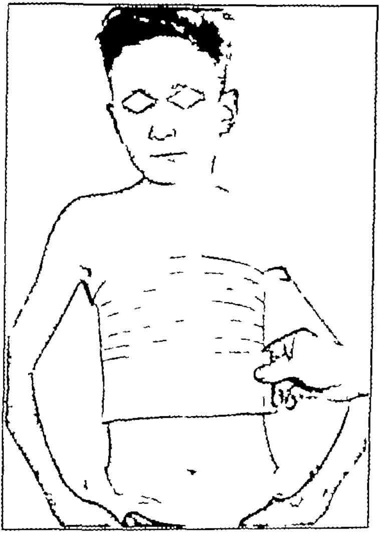


Fig 35 —Descending spiral bandage of chest and abdomen.

midline at any level from the axilla downward depending upon what portion of the trunk it is necessary to cover

Figure-of Eight Bandage of the Neck and Axilla.— A three-inch bandage is used. It holds dressings in the axilla over the top of the shoulder and low on the side of the neck.

The bandage starts on the front of the neck and is carried around the neck on the opposite side of the axilla which is to

A posterior figure-of eight of the back is made exactly as the above, except that it starts over the spine between the scapula and crosses in the back, looping around the anterior sides of the shoulder in the opposite manner from the figure-of-eight of the chest.

Suspensory Bandage of the Breast—A three- or four inch bandage is used Its purpose is to support the breast and to retain dressings on it

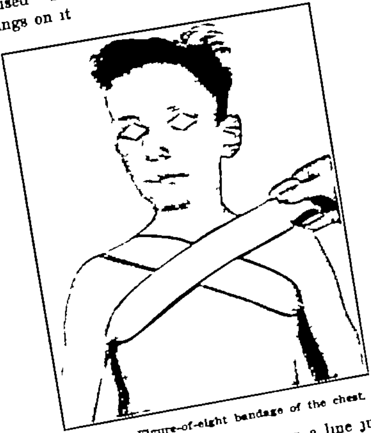


Fig 37—Figure-of-eight bandage of the chest.

It is started on the side of the chest on a line just below the breast to be bandaged Two circular turns are taken around the chest to firmly anchor the end of the bandage. The third turn inclines upward over the lower portion of the breast and is carried over the opposite shoulder From there it is carried downward across the scapula on the side of the bandaged breast The turns then are in general like those shown in Fig 37

Generally speaking the binder combined with the shoulder straps is better suited for binding the breasts than the circular bandage, hence the latter is seldom seen outside the classroom

Velpeau Bandage—The chief use of the Velpeau bandage is to test the mechanical ingenuity of the student The Sayre bandage of adhesive strips has superceded it in practice

A three inch bandage ten yards long is used It is used after fracture of the clavicle or scapula or to fix the arm to the chest after the reduction of a shoulder dislocation



Fig. 38—First and second turn of the Velpeau bandage.

The fingers of the arm on the injured side should be placed in the supraclavicular fossa of the opposite side The elbow of the injured side should be pushed toward the midline as far as possible pushing the affected shoulder upward backward and outward. The operator should face the patient when applying the bandage A pad should be placed in the axilla of the in

jured side to prevent the side of the arm and chest from lying in contact, thus setting up irritation of the skin

The bandage should be started on the chest just below the axilla on the uninjured side. It is then carried obliquely upward across the back to the injured shoulder It should cross the injured shoulder as far out as possible, passing over the



Fig. 39 —Two turns of the Velpeau bandage.

arm about the insertion of the deltoid muscle From there it passes around the outer side of the arm and under it crossing the chest transversely to the point of beginning of the bandage and anchoring it The second turn is carried transversely across the back and across the end of the elbow fixing it firmly to the chest (Fig 38) It is then carried around under the uninjured arm up to the injured shoulder overlapping the previous turn

over the shoulder coming a half inch or more toward the neck. From here it passes downward over the arm and under the elbow to the starting point The oblique and transverse turns are alternated (Fig 39) each transverse turn pushing a little higher up the arm and forearm until all but the hand are cov

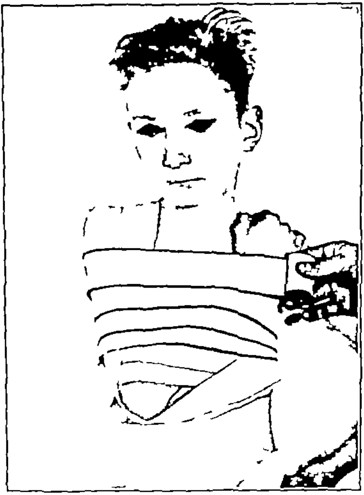


Fig. 40 —Completed Velpeau bandage.

ered (Fig 40) Three or four turns over the shoulder are all that is necessary after which the bandage may be finished by several spiral turns about the chest and arm The spiral turns should be carried up to the axilla on the uninjured side. The overlapping turns of this bandage should be held by adhesive strips or by sewing them

Bandages of the Upper Extremity

The upper extremity presents the field for the exercise of the finest art in bandaging Bandages are required in this region more than in any other and their exposed position invites inspection of the surgeon's skill



Fig 41 —Spica bandage of the shoulder

Spica of the Shoulder—A three-inch bandage eight yards long should be used This bandage will hold dressings over the point of the shoulder or in the axilla

The bandage is started at the middle of the arm and is extended upward as an ascending spiral until the axilla is reached It is then carried around the chest through the opposite axilla across the back to the injured shoulder where it crosses the last

spiral turn about the arm midway between the front and the back of the arm It is then carried around the arm and back across the chest as before (Fig 41) This is continued until the shoulder is covered as far as the neck

Bandages of the Arm.—A two-inch bandage is used Dressings are usually held on the arm by means of a spiral or spiral reverse.

Bandages of the Forearm.—A two-inch bandage is used The forearm on account of its conical shape, is best bandaged by means of a spiral reverse bandage as shown in Fig 23 or by a figure of-eight bandage.

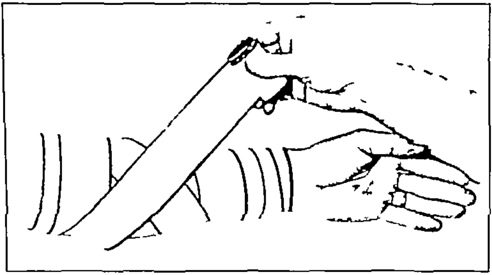


Fig. 42.—Figure-of-eight bandage of the forearm.

Figure-of Eight Bandage of the Forearm.—A two-inch band age is used. The bandage is fixed by a circular turn about the wrist. It is then carried upward as a plain spiral until the lower edges of the bandage tend to become loose on account of the rapid enlarging of the arm. It is then changed to a figure-of eight bandage It is then carried up to the elbow and a circular turn is taken about the forearm just below the joint. It is then brought down to the last spiral turn (Fig 42) and a circular turn is made overlapping half the last spiral turn. It is then carried upward to the elbow as before, each figure-of eight turn covering half the preceding one until the arm is

covered It may be finished by several close spiral turns near the elbow

Figure-of Eight Bandage of the Hand.—A one and a half inch bandage is used It covers the back of the hand the wrist, and the palm of the hand

The bandage is started by taking a circular turn or two about the wrist. It is then carried obliquely across the hand to the end or middle of the first phalanx. It is then carried circularly around the four fingers, then spirally upward across the back

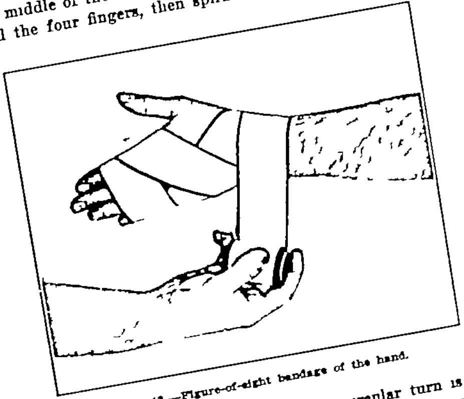


Fig. 42.—Figure-of-eight bandage of the hand.

of the hand to the wrist where another circular turn is taken (Fig 43) These figure-of-eights are then continued until th hand is covered. It is finished by a few circular turns abou the wrist. The thumb is not covered.

Spica Bandage of the Thumb is begun by two circular turns about the wrist. It is then carried obliquely over the back of the thumb to the distal phalanx. The thumb is then covered almost to the web by an ascending spiral When it reaches almost to the web it is changed to a figure-of-eight around the thumb and wrist (Fig 44) The first figure-of-eight turn about

the wrist should be followed by a circular one to secure it, and the first around the thumb should be followed by a circular one to cover a triangular area which would otherwise remain uncovered A few more figure of-eight turns are necessary to complete the bandage

Finger Bandages—A one inch bandage is used. Several different methods of bandaging may be employed for the finger The fingers may be covered by a plain ascending or descending spiral or by a spiral reverse bandage (Fig 45) If it is desirable to cover the end of the finger a few recurrent turns

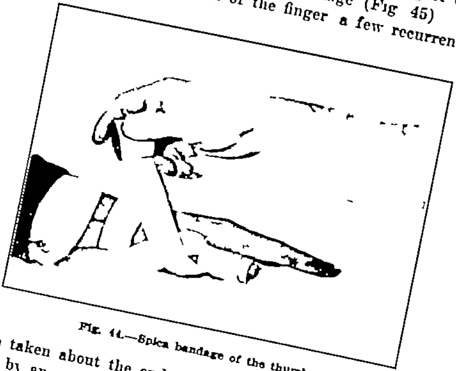


Fig. 44.—Spica bandage of the thumb.

may be taken about the end of the finger and the finger then covered by an ascending spiral or spiral reverse

Figure-of Eight of the Finger and Wrist—A one-inch bandage is used. This bandage is less likely to slip off than the preceding ones.

The bandage is anchored by two circular turns about the wrist from ulnar to radial side dorsum upward. It is then carried diagonally across the back of the hand and spirally around the finger to the tip The end of the finger may then be covered by recurrent turns if necessary The bandage may then be carried back to the hand by an ascending spiral or a

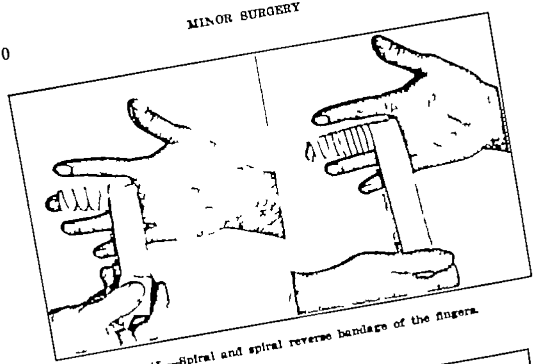


Fig. 45.—Spiral and spiral reverse bandage of the fingers.

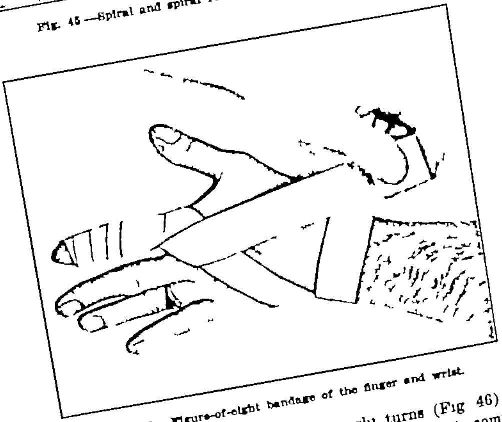


Fig. 46.—Figure-of-eight bandage of the finger and wrist.

spiral reverse One or more figure-of-eight turns (Fig 46) are then carried from the base of the finger to the wrist complet ing the bandage by a few circular turns about the wrist.

Bandages of the Lower Extremities

Because of the constant movements of the lower extremities in ambulant patients the prime object in bandaging is security

Descending Spica of the Groin.—A three to four inch bandage is used This bandage holds dressings in a circular area

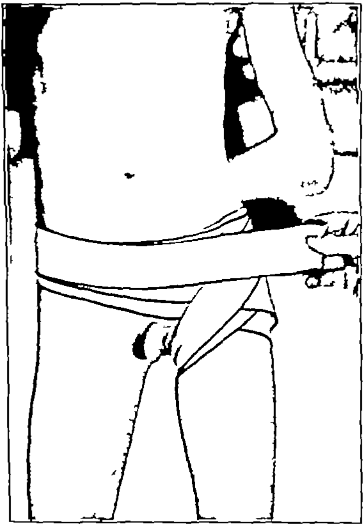


Fig. 47—Descending spica bandage of groin.

about the body on a level with the iliac crests in the groin and on the upper part of the thigh.

The operator faces the patient or the patient lies on his back while the bandage is being applied It is started over the iliac crest on the side opposite the groin to be covered Two circular

turns are taken about the body to anchor it It is then carried obliquely downward across the groin over the outer part of the thigh, then around the thigh, covering the groin, and around the body across the back These figure of-eight turns are then continued (Fig 47), each one a little higher than the preceding one until the groin is covered The bandage may be completed by a few circular turns about the thigh.

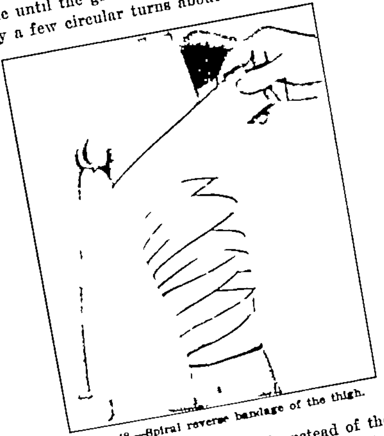


Fig 48.—Spiral reverse bandage of the thigh.

If it is desired to cover the buttock instead of the groin this same bandage is applied with the patient s back toward the operator or the patient lying in the prone position

Spiral Reverse of the Thigh.—A three inch bandage is used. A spiral of the thigh becomes displaced easily if there is much tapering In such a case the bandage should be started just above the knee and carried upward as a spiral reverse (Fig 48) In order to prevent the slipping it is well to continue the bandage as a figure-of-eight of the groin

Figure-of Eight Bandage of the Knee.—A two and a half inch bandage is used This bandage is useful when pressure is

to be applied over the knee as in patellar bursitis or when dressings are to be held on the knee

The bandage is started by two circular turns about the upper part of the leg and is continued upward as a close spiral until the patella is almost reached It is then carried obliquely upward across the back of the joint to a point on the thigh well above the limit of the synovial membrane of the joint It is then carried downward as a close descending spiral until it almost reaches the patella A few figure of-eight turns are then made until the patella is covered One or two circular turns are then made over the patella to complete the bandage (Fig 49)

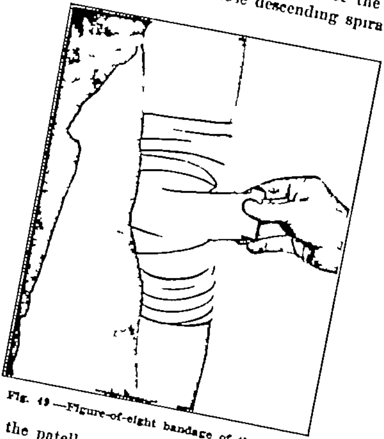


Fig. 49—Figure-of-eight bandage of the knee

Figure-of Eight Bandage of the Calf—A two-inch bandage is used. This bandage is less likely to slip than the ordinary spiral or spiral reverse although these may be used if the leg does not taper too much

It is started by a circular turn just above the ankle and is continued upward as a close ascending spiral until the tapering

portion is reached It is then carried upward to a point just below the knee where a few close descending spiral turns are made The bandage is then continued by figure-of-eight turns (Fig 50), until the part is covered

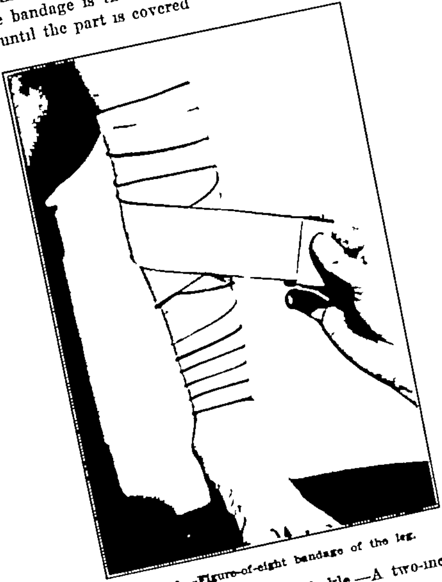


Fig. 50.—Figure-of-eight bandage of the leg.

Figure-of Eight Bandage of the Ankle—A two-inch bandage used

The bandage is started by two circular turns around the leg just above the ankle joint It is then carried obliquely downward across the dorsum of the foot to the base of the toes where a complete circular turn is made about the foot The bandage is then continued by several figure-of eight turns from the foot

to the ankle (Fig 51) and completed by a circular turn about the ankle

Figure-of Eight Bandage of the Foot and Leg—A two- to two and a half inch bandage is used This is made by a combination of the two preceding bandages, except that the bandage is started at the base of the toes and the figure-of-eight of the ankle is completed before that of the leg is started It is then continued as a figure-of-eight of the leg The heel is not covered by this or the preceding bandage

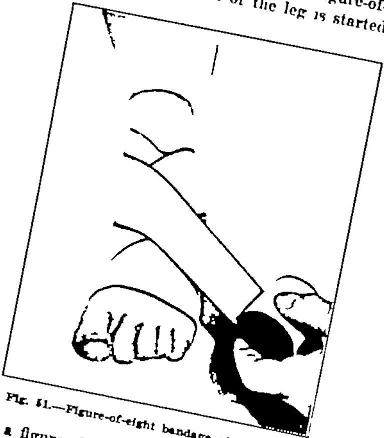


Fig. 51.—Figure-of-eight bandage of the ankle.

Figure-of Eight Bandage of the Heel.—A two-inch bandage is used Its purpose is to cover the heel and the ankle

It is started directly over the ankle anteriorly and carried around the heel by the first turn. The second turn lies a little higher over the heel than the first but crosses the ankle anteriorly directly over the first turn The third turn crosses the heel a little closer to the toes than the first turn but this also crosses the ankle anteriorly directly over the first two (Fig 52) The

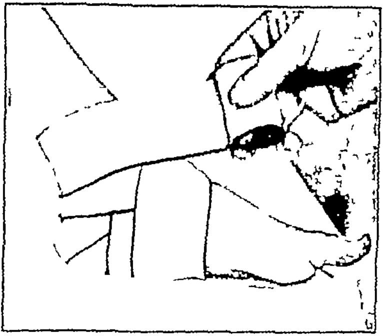


Fig. 62.—Figure-of-eight bandage of the heel.



Fig. 63.—Figure-of-eight bandage of toe and foot.

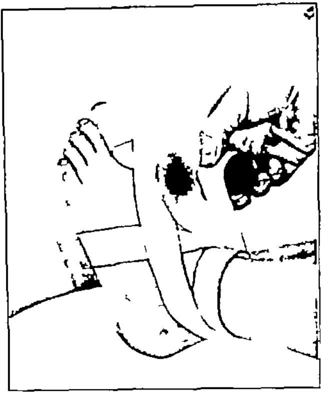


Fig. 54.—Figure-of-eight bandage of the toe and ankle.



Fig. 55.—Recurrent bandage of the toes.

succeeding turns alternately cross the heel a little higher and a little further forward than the preceding but all cross the ankle anteriorly in the same place. The bandage is completed by a turn or two around the ankle

This bandage may be combined with the figure-of-eight of the foot and leg, and when so used it should be the first completed.

Bandages of the Toes—A one-inch bandage is used The toes may be bandaged exactly as the fingers by spiral, spiral reverse, recurrent, or figure-of eight bandages.

Figure-of Eight Bandage of the Foot and Toes—The bandage is started on the dorsum of the foot just above the base of the toes It passes from the inner side out, encircling the foot twice to anchor the bandage It is then carried to the base of the toe to be bandaged, covering the toe to its tip as a descending spiral It is then carried back to the base of the toe as an ascending spiral or spiral reverse One or two circular turns about the foot (Fig 53) complete the bandage. Each of the toes may be successively covered if it is so desired

Figure-of Eight Bandage of the Ankle and Toe—This bandage is started on the inner side of the leg and encircles the leg twice to anchor the bandage When it reaches the inner side of the ankle on the second turn it crosses the foot diagonally to its outer side, passing under the ball of the foot to the inner side of the toe to be bandaged It covers this toe with a descending spiral and ascending spiral or spiral reverse and then passes diagonally across the dorsum of the foot to the outer side of the ankle (Fig 54) where a circular turn or two about the ankle completes the bandage.

Recurrent Bandage of the Toes—A two-inch bandage is used It is often desirable to entirely cover the toes in bandaging the foot and when this is the case the bandage is started as a figure-of-eight of the ankle. After the first oblique turn is made downward across the dorsum of the foot and fixed the recurrent turns are made about the toes and fixed by a few circular turns about the foot. The bandage is then completed as a figure-of eight of the ankle (Fig 55)

CHAPTER III

WOUNDS, HEMORRHAGE AND BLOOD TRANSFUSION

Wounds

Wounds have been described as solutions of continuity The character of a wound depends upon the nature of the object inflicting the injury A cut from a knife produces an incised wound (Fig 56-*A*) A wound of this character has even walls is little likely to harbor foreign particles, and permits of accurate coaptation A stab wound, as by a knife differs from an incised wound in that its depth exceeds its length A thrust from a pointed object produces a punctured wound. Such a wound produced by a round object as a nail pushes the tissues aside and produces a minimum degree of laceration (Fig 56-*B*) The hemorrhage is consequently slight but the chance for the escape of infection carried in by the offending object is remote Gunshot wounds are modified stab or punctured wounds produced by the entrance of the bullet The tissue is in part severed and in part pushed aside. In some types of bullets driven at a certain momentum a more complicated wound, the result of the so-called expulsive effect is produced. If a blunt object penetrates the surface of the body and the tissues are then torn a lacerated wound is produced (Fig 57 *A*) A contused wound is one in which the force is not great enough to cause a complete rupture of all tissues but is sufficient to sever a part of them (Fig 57 *B*)

Hemorrhage

Nearly simultaneous with the reception of a wound hemorrhage begins. The degree and character of it depend upon the region incised. When a large vessel is severed death from hemorrhage may occur in a few moments How much blood may be lost before death ensues depends upon circumstances. It is stated that half the total volume of blood must be lost before death will result. This would mean about one pound to

each 25 pounds of body weight or six pounds for the average-sized man. The more rapid the loss of blood, the more intense the effect. Frequently when there is a loss of blood there is the added danger of shock. A prolonged slight hemorrhage may produce serious consequences by producing changes in parenchymatous organs.

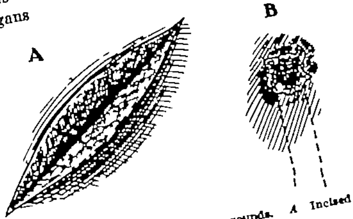


Fig. 56.—Diagrammatic representation of wounds. *A* Incised wound. *B* Punctured wound.

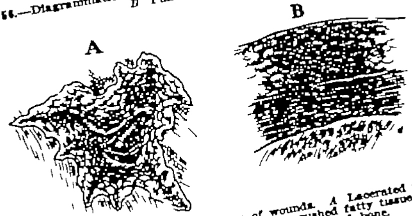


Fig. 57.—Diagrammatic representation of wounds. *A* Lacerated wound. *B* Contused wound. The upper stratum represents crushed fatty tissue, the middle, the crushed muscle layer, and the lower unchanged bone.

Factors Which Influence the Amount of Hemorrhage.—The amount of hemorrhage which a certain degree of injury will produce is dependent upon the mechanics of the injury, the hydraulics of the circulation and the chemical state of the blood.

Nature of the Wound.—A clean wound bleeds more freely than a lacerated one. Hemorrhage stops spontaneously by the closure of the vessels by a clot. Complete section of a vessel often causes less bleeding than a partial severance because the

completely severed vessel may retract into the tissues, which permits the surrounding soft parts to aid in producing the clot In a partial section the retraction is prevented and the hemorrhage continues When a vessel is imbedded in a resistant tissue which prevents the vessel from contracting and retracting hemorrhage is likely to be severe This is noted in arteries in the bones, vessels of the uterus, etc. Lacerated vessels invite clotting because the fringes of the torn vessel collect fibrin, thus aiding in the production of a clot Certain crushing wounds such as traumatic amputation by a flanged wheel, compress the vessels so that their walls adhere, acting in this way as an angiotribe. In this manner a thigh may be amputated without hemorrhage resulting

Pressure of the Blood.—Naturally the rate of escape of a fluid is dependent upon its pressure Injuries attended by shock with the resultant low blood pressure bleed less than a like injury in which shock is absent Conversely, a vessel that has ceased to bleed while the patient is in shock may bleed again when the patient recovers from the shock and the pressure rises again. The relation between shock and hemorrhage has an important bearing on the control of hemorrhage It is important to note, therefore that in a crushing injury before the patient is sent on his journey to the hospital it may be well to apply a constrictor bandage proximal to the seat of injury lest hemorrhage begin when help is not at hand. Continuance of a hemorrhage until the patient becomes syncopic with the resultant blood pressure reduction permits the blood to coagulate and the hemorrhage ceases. Excitement and apprehension by keeping the blood pressure up may cause the hemorrhage to continue. Patients bleeding from a ruptured tubal pregnancy or a slipped ligature after an abdominal operation become apprehensive and restless, thus favoring hemorrhage and consciousness is not lost until a fatal degree of hemorrhage has occurred. Persons with high blood pressure bleed more profusely than those in whom the pressure is normal Those with atheromatous walls bleed more persistently than those with normal walls, other things being equal.

The Nature of the Blood—The state of the blood has much to do with the severity of hemorrhage

Anemia.—A variety of anemic states favor hemorrhage Idiopathic anemias, anemias due to infectious diseases, act in this manner The platelet count is probably of greater importance than is the red and white count because of the more intimate relation they bear to clot formation It is desirable in all instances to determine the clotting time of the blood before undertaking operation in the presence of such lesions

Jaundice—Cholemia is attended by persistent bleeding Long standing jaundice is more pernicious than acute states The failure of the blood to clot in these conditions is not well understood The actual clotting time as determined by the usual tests often is not materially lengthened, yet these patients are apt to have troublesome hemorrhages following operation

Hemophilia.—Congenital blood states characterized by a diminished clotting power of the blood are occasionally met with The fundamental factors are not understood History of the individual as pertains to previous injuries and the history of a like state in the family is often obtained In such individuals operative indications should be more rigidly restricted and when unavoidable additional safeguards should be employed

Results of Hemorrhage—That hemorrhage may endanger the patient by the direct loss of blood is obvious. That a loss of blood not in itself serious may have grave after effects is too often overlooked

Immediate—The immediate result of acute hemorrhage of sufficient degree is death Cerebral anemia is the immediate cause Blanching of the skin, dyspnea from defective aeration precede it Syncope after a varying degree of loss of blood ensues without a return to consciousness.

Lesser degrees with or without syncope are characterized by feebleness dizziness from relative cerebral anemia dyspnea from defective aeration Both of these are increased by exertion because it increases the demand for oxygen Raising the head increases cerebral anemia Conversely lowering the head lessens the dizziness and dyspnea

Remote—A patient may recover from the immediate loss of blood only to succumb to secondary changes resulting from the anemic state Fatty degeneration of the parenchymatous organs

or secondary disease such as pneumonia may arise. Other diseases existent previous to the hemorrhage may take on renewed activity after the hemorrhage and menace the life of the patient.

Management of Hemorrhage.—The management of hemorrhage demands the consideration of several factors. In cases in which there is an abnormal tendency to bleed an attempt to restore the normal must be made prior to operation. These are prophylactic measures. In some cases temporary expedients must be resorted to when it is not possible to employ ideal methods. These are temporary or emergency measures. Finally methods may be employed which are best suited for the particular state or condition. These are methods of election. When for any reason the likelihood to hemorrhage is greater than normal means should be instituted to lessen this disposition. CaCl has been given for several days before the operation in order to increase the coagulability of the blood. Horse serum is used at the time of operation for the same purpose. Transfusion is employed by many surgeons both to increase the coagulability of the blood and to render the patient less susceptible to the loss of blood incident to the operation. Inasmuch as the value of these means is not definitely established as little reliance as possible should be placed in them. Whenever possible the underlying cause should be removed. A general anemia may be treated, an abscess may be drained to relieve a secondary anemia or a malignant growth may be cauterized. A jaundice may be relieved by draining a gall bladder in order to relieve the cholemia before attacking a common duct stone or an obstructing tumor.

In operative wounds mechanical prophylaxis may be definitely planned. The most fundamental is preliminary ligation. The blood supply is sought and controlled at the most central part of the field of operation as in ligation of the external iliac artery in amputations at the hip joint. In operations upon the extremities Esmarck's constriction may be employed. This consists in placing a rubber band above the site of operation and producing compression sufficiently great to compress the vessels. This method is now largely abandoned because the compression is

objectionable in many instances, and an artificial anemia during the time of operation may be attended by after hemorrhage

In preliminary ligation the main trunks only are controlled and a large number of smaller vessels are allowed to bleed and are controlled after they are severed If the vessels are terminal all the vessels are controlled Often, however, there are vessels at the site of operation which arise from vessels proximal to the point of ligation Thus in the ligation of the femoral in hip joint amputation, while the main channels are occluded, anastomosing branches from the iliac vessels are not involved in the preliminary ligation and require ligation when severed These anastomosing vessels are not large enough to greatly annoy the surgeon or to endanger the life of the patient.

Emergency Control of the Hemorrhage—Measures may not be at hand for the proper control of hemorrhage or their employment may require too much time If a hollow tube leaks, instinct teaches us to compress its lumen. The quickest way of stopping hemorrhage is to compress the lumen of the vessel This can best be done by some object as a piece of gauze The vessel may be compressed by constricting the limb with a rubber tube or string These are employed as temporary measures during operations. When several points bleed they are compressed with gauze while they are caught up with forceps one at a time.

The Method of Election—Strictly speaking the method of election is a ligature, in some instances other methods are employed as a tampon, as in bone cavities the cautery as in oozing surfaces or chemical cautery where the actual cautery cannot be employed

Ligation.—Control of a bleeding vessel by means of a ligature is the method of election It is ideal because it accomplishes the purpose desired without any objectionable features. The wound can be closed and healing is not interfered with The action of the ligature is as follows The compression of the intima by the ligature destroys it. The edge of the intima being exposed to the blood in the vessel causes the blood to coagulate Usually the clot extends upward to the point of origin of the first branching vessel This coagulum becomes organized and forms a firm occlusion of the vessel. In order for the ligation to be effective

these principles must be fulfilled The technic of ligation is simple, the vessel is caught up by forceps and is tied with a ligature No tissue except the vessel should be caught up and no more foreign material than necessary should be employed that is the ligature should be as small as is consistent with safety No more tissue than the vessel should be included be cause such tissue is deprived of its proper source of nutrition It is a mistake, however, to assume as formerly taught that such tissue dies and becomes a necrotic mass which must be removed by phagocytosis On the contrary it obtains nutrition from the surrounding tissue by osmosis and lives as a tissue transplant. It does place a burden on its environment however, and in the case of disturbed wound healing actually becomes a necrotic mass In some situations the surrounding tissue should be included in the ligature When the internal pressure is great the vessels large and near the heart perivascular tissues may be included in the ligature In splenectomy for instance where these conditions obtain, a ligature on the bare vessel may cut through the walls of the vessel and hemorrhage result

Material Employed.—The materials for ligation may consist of catgut or fine silk. In small vessels catgut is preferable because it is removed by absorption This is particularly important in infected wounds The statement of a noted surgeon that the introduction of the use of catgut by Lister was the greatest achievement in surgery would lose its force entirely in the absence of aseptic wounds For large vessels catgut must be used with caution. The constant tugging of the vessel caused by the pulsations against the knot may loosen the knot and hemorrhage may result or a fine gut may become absorbed before the vessel is occluded. These difficulties do not condemn catgut, but they emphasize the need of judgment in the selection of a gut suited to the region in which it is to be used For small vessels a small plain gut is preferable but in large vessels chromic gut of a larger size must be employed. Silk is seldom if ever required but if the silk is sterile and the wound is kept so the silk will become imbedded and cause no trouble Silver wire has been used to ligate vessels of large size It possesses the disadvantages of silk without any advantages except that of ease of sterilization

Technic.—Ordinarily the end of the severed vessel is caught up by artery forceps and by making traction on these, a ligature may be placed about the vessel. Sometimes the vessel cannot be accurately caught up and it cannot be made to protrude from the tissues sufficiently to enable the operator to place a ligature. In such cases the ligature is carried through the surrounding tissues by means of a curved needle in such a manner as to include some of the surrounding tissue. Also when the vessel is not severed the technic must be modified by carrying the ligature about the vessel by the aid of a forceps, an aneurysm needle or an ordinary full curved suture needle passed eye end first.

Suturing.—(Suturing proper will be discussed under wound healing.) The suture is often employed to coapt the edges of the wound and to act at the same time as a hemostatic. In scalp wounds in which the bleeding comes from vessels in the thick resisting skin this means is permissible because of the difficulty of securing the bleeding points. In principle the use of the suture for this dual purpose is objectionable. The vessel is not accurately occluded and late oozing is quite possible and the suture in order to occlude the vessel must be drawn tighter than the coaptation of the wound requires. Hence strangulation of the edges of the wound is engendered. In accomplishing the dual purpose neither is done well. In nearly all cases careful ligation and temporary compression will obviate the use of this method.

Tamponade.—Compression of bleeding surface is a common temporary means of hemostasis as already stated.

As a permanent means of hemostasis packing with gauze is useful where the bleeding points cannot be secured as in bleeding from bone occasionally in deep cavities where the bleeding points cannot be located. In surface oozing as in skin grafting this means is often resorted to. In such instances the need is usually but temporary and the pack may usually be removed before the completion of the operation. In some instances as in jaw resection and in amputations of the rectum a tamponade may serve both to check the flow of blood and to prevent infection. When used for this purpose efficiency is gained by using a gauze impregnated with some insoluble substance like iodo-

benzine The soldering iron is transportable, always works and holds a low heat for a long time. A source of heat is needed and several irons are required so that one or more may be in the furnace while the other is being applied to the tissues. Though cumbersome this is the most effective and certain apparatus. The electric cautery is convenient when a source of electricity is at hand and admits of more delicate manipulations and can be used when small spaces are to be entered.

Secondary Hemorrhage—By secondary hemorrhage is meant in its broadest sense the occurrence of bleeding after it has once ceased. The old surgeons employed it to designate those instances in which hemorrhage followed the separation of the (silk) ligature from a vessel in a suppurating wound or the separation of its charred surface after the use of the cautery.

The modern cause of secondary hemorrhage is different. Not infrequently a wound that is dry when the wound is closed will later fill with blood or bleeding will take place from the free surface of an exposed wound (as the tonsil). Hemorrhage which has ceased from the contraction of the vessel from the use of suprarenin or temporary compression by a forceps or from the reduced blood pressure from other causes, as profound anesthesia may begin again when the vessels become patent. The slipping of a ligature likewise may permit late bleeding. These conditions are easily comprehended and their occurrence is easily obviated by a careful control of hemorrhage at the time of the operation. The tyro sees much of them; the master but little.

Secondary hemorrhage in its most ancient sense has lost much of its importance since the advent of asepsis. The principles which underlie it are still important, because while secondary hemorrhage is rare it does occur and the principles underlying it may be applied to other conditions.

In an Infected Wound.—The purpose of the ligature prior to the advent of antisepsis was to occlude the vessel until the part of the vessel distal to the ligature became necrotic and sloughed off. The silk with which the ligation was done was cut long so that it might be pulled from the wound after separation had taken place. This requires ten days. A clot proximal to the ligature forms as already described but instead of going on to or

ganization, if the infection gains access to the vessel lumen, prevents the change from fibrin into fibrous tissue The infection prevents the formation of fibrin bridges between the clot and the vessel and therefore fibrous tissue cannot form When the separation of the vessel distal to the ligature occurs, the ligature becomes liberated and the proximal part of the vessel opens and the unattached clot is forced out by the pressure of the blood behind it Secondary hemorrhage is impossible in the presence of conditions permitting of primary healing

More important in the present state of surgical technic than secondary hemorrhage in infected wounds is that occurring after the use of the cautery and from pressure from drains The principle is the same The cautery coagulates the elements necessary for the production of fibrin and a clot does not form The vessel is sealed mechanically by the seared tissue In due time the dead tissue separates from the living and the lumen of the vessel is patulous and hemorrhage ensues. Usually a clot forms as after aseptic ligation and organization follows in a normal way Excessive heat is more apt to be followed by a secondary hemorrhage If the cauterized area is likewise the seat of suppuration, both factors are active

Similarly hemorrhage may follow when drainage tubes are allowed to come in contact with large vessels The pressure of the tube against the vessel wall in the presence of suppuration causes erosion of the wall and not being protected by new fibrin formation the vessel is opened and hemorrhage ensues. Whenever a vessel is to be occluded the presence of an environment conducive to the formation of fibrous tissue is essential When this cannot be certainly provided, secondary hemorrhage must be anticipated.

Secondary hemorrhage may occur in conditions where blood coagulation is interfered with because of general diseases These include all those already mentioned notably infections of the blood itself and in jaundice Here the prevention of fibrin formation is due to constitutional rather than local conditions, but the healing of the wound is just as certainly prevented and secondary hemorrhage is apt to follow In some conditions fibrin forms in a normal or nearly normal manner, but the subsequent changes into fibrous tissue are interfered with. In these con

ditions, too, when operations are urgent, secondary hemorrhage should be kept in mind. Extra care in hemostasis at the time of operation and prophylactic tamponade with gauze with or without its impregnation with some chemical does much to obviate it. In addition the attendant is warned of the possibility of such an occurrence and advised as to the steps that are required to combat it.

Constitutional Treatment of Hemorrhage.—Various means have been employed to increase the coagulability of the blood or to otherwise control hemorrhage. Gelatin was employed for a time. Horse serum has been more recently employed with reports of good results. Adrenalin is a problematic remedy. While it controls the arterioles, it raises the blood pressure. Ergot used for the same reason is quite useless. The only potent remedy is a full dose of morphine. This quiets the patient and avoids a rise of the blood pressure from his own efforts.

Treatment of Anemia Following Hemorrhage.—After the hemorrhage has been arrested the general condition of the patient must receive attention. The amount of blood lost may endanger the patient from acute anemia. Having passed this danger, he may be slow in recovering from the effects of the loss of blood and general treatment may be required in aiding a restoration to health.

Acute.—In severe cases when syncope threatens the urgent indication is the relief of cerebral anemia. This is facilitated by causing the available blood to gravitate to the brain. The patient's head is lowered and the limbs bandaged to force the available blood to the vital centers. If the volume of fluid within the circulatory system is insufficient, the introduction of a saline solution within the vessels may save life. Direct transfusion of human blood is the most valuable procedure in acute hemorrhage if means and measures are available for performing the operation. In less urgent cases saline solution may be introduced under the skin or into the rectum or in more urgent cases directly into a vein.

In the use of intravenous injections caution should be used not to overburden the heart. An excess of fluid may temporarily rescue only to kill by heart paralysis. The patient rather than

the graduate containing the solution should be watched When results are obtained transfusion should cease whether the dictum of the textbooks has been satisfied or not The operator should remember that in transfusion he has a potent but dangerous remedy

Blood Transfusion

Although the transfusion of blood is a relatively simple procedure it is not without its dangers, chief among which are severe and even fatal reaction from blood incompatibility acute dilatation of the right side of the heart from a too sudden increase in cardiac load, and acute nephritis with anuria which may follow even when compatible blood is used

A satisfactory donor is essential The best donor is a young man from eighteen to forty years of age having prominent antecubital veins A woman s veins are smaller and often buried in fat The history physical findings and serologic tests must be negative Malaria tuberculosis gonorrhea and acute contagious diseases should be considered The blood of possible donors and of the recipient *must* be *grouped* and the *donor chosen from the* same group as the recipient or from a satisfactory universal donor This is done to make sure that the serum of the donor will not agglutinate or hemolyze the corpuscles of the recipient or vice versa Since hemolysis never occurs without first agglutination the determination of the agglutination reaction determines the hemolysis also As a check against the possibility of error in grouping the blood of the donor and recipient must be cross agglutinated immediately before the transfusion This test also eliminates danger from sub-groups or groups other than the usual four

Moss s classification of human blood on the basis of isoagglutination has resulted in the formation of four groups

Group I. Sera agglutinates no corpuscles
Corpuscles agglutinated by sera of Groups II III and IV

Group II. Sera agglutinates corpuscles of Groups I and III.
Corpuscles agglutinated by sera of Groups III and IV

Group III. Sera agglutinates corpuscles of Groups I and II
Corpuscles agglutinated by sera of Groups II and IV

Group IV Sera agglutinates corpuscles of Groups I, II and III.
Corpuscles agglutinated by no sera

The percentage of individuals falling in each group is approximately

Group	Percentage
I	10 per cent
II	40 per cent
III	7 per cent
IV	43 per cent

There is a small percentage of individuals who show other types of agglutination These are (*a*) sub-groups which have additional true isoagglutinins, and (*b*) those who show pseudoagglutination or rouleau formation

The blood group of an individual is usually established early in infancy and may be present in the newly born making it necessary to use the same careful procedure when transfusing infants and children as with adults This is true even though the infant's mother be the donor Blood groups, when once established, are stable and it is probable that they remain the same throughout life.

In order to determine the blood group one must have available known II and III sera In preparing this sera blood is drawn from known II and III individuals and the respective serum is separated off into sterile test tubes and placed on ice It should have a high agglutinin content and be specific in its action i.e., must not agglutinate corpuscles of its own group The agglutinins are stable but sera older than six months should not be used

From the person to be grouped several drops of blood are obtained and placed in a small test tube with 4 or 5 c c of 1 5 per cent sodium citrate in physiologic salt solution making a thin suspension of corpuscles. One drop of this corpuscle suspension is placed with one drop of known group II serum on a porcelain mixing plate and thoroughly mixed. A similar preparation is made with corpuscle suspension and known group III serum The preparations are gently agitated several times and examined at intervals for thirty minutes If agglutination occurs the corpuscles will clump and will appear as fine red dust in the clear serum If no agglutination occurs, the cells will remain in suspension The reaction of blood from the four groups is shown in Fig 58

With satisfactory known sera the agglutination reaction is definite begins within five minutes and is complete in thirty As a check on the macroscopic reading a small amount of each prepa

ration is placed on a slide and viewed with the microscope Rouleau formation is disregarded

After the groups have been determined and the donor chosen, the donor's blood and that of the recipient are cross-agglutinated This is done by using a preparation similar to the above, but con

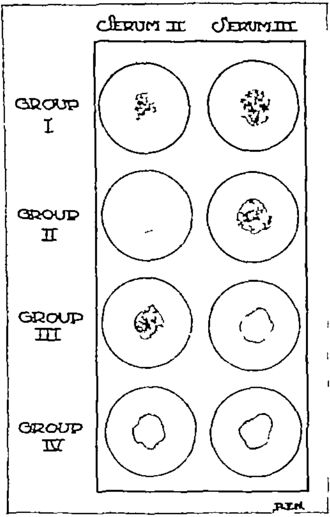


Fig. 58.—Showing the reaction of corpuscles of various groups with Group II and Group III sera. (From Haden Clinical Laboratory Methods.)

sisting of a suspension of the donor's corpuscles and recipient's serum and another of the donor's serum and recipient's corpuscles. There should be no agglutination in either preparation.

The amount of blood given in a transfusion depends upon the age and condition of the recipient and varies from 50 to 1000 c.c.,

the average being 500 c.c. A healthy donor can lose 500 c.c. of blood without any symptoms.

The symptoms of incompatible blood mixing are tingling pains all over the body, feeling of fullness in the head, progressive precordial distress, dyspnea, cyanosis, slowing pulse rate, loss of consciousness, and death.

There are three generally recognized methods of blood transfusion, namely, the direct method and two indirect methods, one in which the whole blood is transferred unaltered while in the other an anticoagulant is used.

Direct Transfusion.—By this method an anastomosis is made between the artery of the donor and the vein of the recipient. The radial artery and the median cephalic or basilic at the elbow are used. A great variety of methods has been devised to perform this method of transfusion, to all of which many objections have been found so that none of them are used.

Indirect Transfusion.—In indirect transfusion an apparatus is used to transport the blood from the donor to the patient. The blood may be transferred without the addition of an anticoagulant or a coagulant may be added.

Unaltered Whole Blood Transfusion.—By this method blood is drawn into a glass syringe from the vein of the donor and injected immediately into the vein of the recipient before clotting has time to take place.

This method cannot be performed by one person; it requires at least two and better three to perform it rapidly enough to prevent trouble from blood clotting in the apparatus used. A set of from three to five syringes is used. Fifty c.c. syringes are most convenient although 30 c.c. may be used. The needles should vary in size from No. 13 to No. 18. The largest that can be introduced into the vein is best because there is less trouble with clotting in a large needle. The needle should have a short bevel to render it less liable to pass through the opposite wall of the vein and should be very sharp so that it may be made to enter the vein without undue force. Two stopcocks are necessary, one end of which fits the needle in the vein and the other end of which fits the end of the syringes used. The apparatus is steril

ized and rinsed with a sterile 2 per cent solution of sodium citrate before the transfusion is begun.

The donor and recipient should be recumbent on beds or operating tables near enough together that the operators may reach from one to the other without undue delay. Tourniquets are placed above the elbows of each just tight enough to obstruct the flow in the vein without obliterating the arterial pulse. The skin is painted with 7 per cent tincture of iodine and this is removed with alcohol to make the veins more easily visible. One needle with stopcock attached is inserted into the vein of the donor in a direction opposite to the flow of blood in the vein, although if the vein is large this is not so important. The other needle with stopcock attached is inserted into the vein of the recipient in the direction of the flow of the blood. A free flow of blood through the needles indicates that the needles have been properly placed. The tourniquet is then removed from the arm of the recipient and the transfusion is begun. From 20 to 30 c.c. of blood is drawn from the donor and injected into the recipient. An assistant then cleanses this syringe with sterile normal saline and rinses it with sterile 2 per cent sodium citrate solution. In this way if sufficient help is available one syringe is being used to inject blood, one to withdraw blood and one is being washed and rinsed simultaneously. A small amount of sterile 2 per cent sodium citrate solution may be injected through the needles at intervals which keeps the blood from clotting in them. If the veins are too small to use needles cannulas with short rubber tubes and clamps attached are substituted, the veins being cut down upon and the cannula inserted and tied into them.

Sodium Citrate Method.—The sodium citrate procedure can be done without trained assistants hence it is the method which lends itself best to emergency practice.

By this method the total amount of blood to be given is removed from the donor and mixed with an anticoagulant and then transfused into the recipient. The anticoagulant used is sodium citrate and the quantity of this used is such that the sodium citrate equals approximately 0.2 per cent of the total amount of blood transfused. This amount is not arbitrary as a little more or less may be used without danger to the blood or

to the recipient. The apparatus required is needles or cannulas, one glass flask, and one gravity tube with rubber tubing attached This apparatus, needless to say, should be sterilized before using

If, let us say, one wishes to give 500 c c of blood, place 50 c c of a 2 5 per cent sterile sodium citrate solution in the flask The arm of the donor, which has been painted with tincture of iodine and this removed with alcohol, is constricted by the tourniquet until the veins become prominent A needle with a short piece of tubing attached is thoroughly rinsed with 2 per cent sodium citrate solution and inserted into

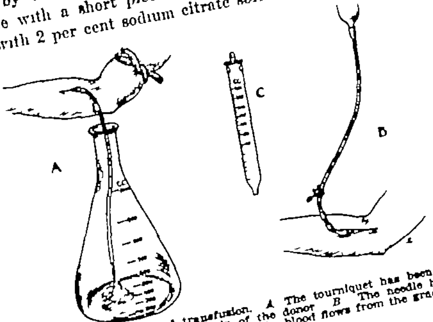


Fig. 59—Technic of blood transfusion. *A* The tourniquet has been applied and the needle inserted into the vein of the donor *B* The needle has been inserted into the vein of the recipient and the blood flows from the graduate, *C* through the tube and needle into the vein.

the vein and the blood is allowed to flow into the flask containing the sodium citrate until the required amount is received (Fig 59) The flask is gently agitated to insure the mixing of the two fluids After the blood is received the tourniquet is removed and the needle withdrawn, pressure being made for a few minutes over the site of puncture to prevent the formation of a hematoma A sterile dressing and bandage is then applied The blood may be given the patient immediately or may be transported some distance if the patient is not present or the blood may be kept on ice from twelve to twenty four hours before being given It must, of course be guarded against contamina

tion If cooled it must be warmed in a water bath before being given In giving the blood the recipient's arm is prepared in the same manner as that of the donor and the needle inserted in the direction of the blood flow (Fig 59 *B*) and the tourniquet removed from the arm The citrated blood is poured into the gravity tube through several thicknesses of sterile gauze in the glass funnel (Fig 59 *C*) the air expelled from the tube and the blood allowed to flow into the recipient s vein by the force of gravity The speed of flow may be regulated by raising or lowering the gravity tube One half hour should be used in giving 500 c c of blood unless it is given for hemorrhage and it is urgent that the patient receive the blood quickly Tightness of the chest or dyspnea are indications to stop the flow for a few minutes. After the transfusion is concluded the arm is treated the same as the donor s.

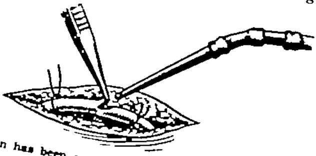


Fig. 60 —The vein has been exposed, the vein nicked and the cannula is about to be introduced.

Some refinement of technic might be mentioned such as injecting a few drops of 2 per cent novocaine into the skin at the site of needle puncture and it is sometimes easier to strike a vein if a fine sewing needle is pushed through the skin at the edge of the vein through the vein at right angles to it and brought out through the skin on the other side of the vein. This pins the vein to the skin and prevents it from slipping around while one tries to puncture it. If the vein is too small or the patient too fat to permit the operator s introducing the needle through the skin the vein must be exposed and the vein cut into and a cannula introduced (Fig 60) The use of the tourniquet makes the vein more readily found This little operation is done under novocain anesthesia.

to the recipient. The apparatus required is needles or cannulas one glass flask, and one gravity tube with rubber tubing attached. This apparatus, needless to say, should be sterilized before using.

If let us say, one wishes to give 500 c.c of blood place 50 c.c. of a 2.5 per cent sterile sodium citrate solution in the flask. The arm of the donor, which has been painted with tincture of iodine and this removed with alcohol is constricted by the tourniquet until the veins become prominent. A needle with a short piece of tubing attached is thoroughly rinsed with 2 per cent sodium citrate solution and inserted into

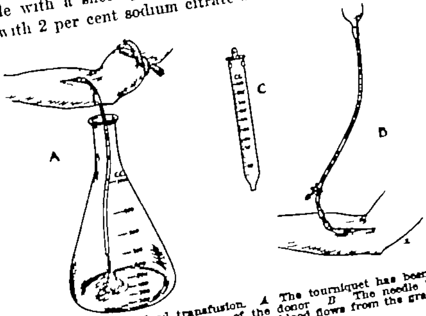


Fig 59—Technic of blood transfusion. A The tourniquet has been applied and the needle inserted into the vein of the donor. B The needle has been inserted into the vein of the recipient and the blood flows from the graduate, C through the tube and needle into the vein.

the vein and the blood is allowed to flow into the flask containing the sodium citrate until the required amount is received (Fig 59). The flask is gently agitated to insure the mixing of the two fluids. After the blood is received the tourniquet is removed and the needle withdrawn pressure being made for a few minutes over the site of puncture to prevent the formation of a hematoma. A sterile dressing and bandage is then applied. The blood may be given the patient immediately or may be transported some distance if the patient is not present or the blood may be kept on ice from twelve to twenty four hours before being given. It must, of course be guarded against contamina

Indications for Operations in Presence of Anemia.—The existence of anemia increases the risk of operation. The difference is not marked until the hemoglobin percentage is less than 70. Very low hemoglobin percentages are not incompatible with eventless recoveries, however, and much may be predicted from the cause and type of the anemia. In acute anemias resulting from a sudden severe hemorrhage, as after trauma or hemorrhage from an ulcer, the prognosis is graver than after anemia of like grade coming on after repeated small hemorrhages as from the uterus because of myoma. In the latter case Byford has recently pointed out that the patient develops a sort of immunity to his anemic state. On the other hand, the hemoglobin percentage is not as reliable an index as are the cell forms of the blood. Many aplastic cells indicate a greater risk than an uniform cell form. Ordinarily operations are not performed on patients whose hemoglobin is below 50 per cent, and if below 30 per cent, the blood state adds a considerable risk to the operation.

The advantages of the citrate method are that it is as efficient as any other method, the apparatus is simple, the technic not difficult, there is less likelihood of anything going wrong and that it may be done anywhere and by one person.

Transfusion in infants and very young children is often difficult because of the small size of the vein. It is sometimes necessary to transfuse for melanoneonatorum or for shock following operation for congenital pyloric stenosis or intussusception If such necessity arises there are three places most available, namely, *the superior longitudinal sinus* the internal saphenous vein near the ankle and the external jugular vein For the former the needle is inserted near the upper angle of the anterior fontanelle A sense of resistance is felt when the needle pierces the wall of the sinus followed by a *disappearance of the resistance* It is unnecessary to say that one must be sure that the needle has entered the sinus as evidenced by the free and continuous flow of blood from the needle If the internal saphenous vein is selected it must be cut down upon and a small cannula used Some have used the internal jugular vein but this must be cut down upon and leaves a visible scar

In the more remote management of acute hemorrhage the general environment of the patient should be made as favorable as possible Iron is frequently given but the results are uncertain Usually the patient recovers rapidly and in a surprisingly short time regains his normal condition

Secondary Anemia.—Sometimes after acute hemorrhage the patient is unable to regain his former state and some degree of anemia results This is more apt to occur after a series of lesser hemorrhages than after a single large one The condition here discussed is characterized by a greater or less reduction in hemoglobin and changes in the blood picture. This condition may resemble the pernicious type of anemia closely

Treatment.—General hygienic measures and a dietary are usually of more value in the treatment of secondary anemias than drugs. However syrup of the iodine of iron arsenic and general tonics may be of value Small transfusions or the intramuscular injections of alien blood may add the stimulus needed to help the patient up the grade to health

With this dilatation of the vessels and the exudation of leucocytes and serum, the contest between the bacteria and the tissues begins The leucocytes quickly surround the invading organisms and engulf them If the cells are killed in the battle they are cast off on the surface as a white milky fluid which is recognized as pus. The student should see in pus a Flanders' Field unhallowed by bard or poet The old authors whom we pity for their ignorance, called it "laudable pus" yet so it is. If it were not for the sacrifice of these leucocytes for the protection of the body a single bacterium would be sufficient to kill the individual and the race would be extinguished in a generation The fundamental fact to be gained from this is that it is the cause of the pus which must be considered our enemy and not the pus itself

When the area of tissue which dies is large we speak of it as a slough when it is still larger as whole sections of tissue, we speak of it as necrosis and when a whole limb is lost we speak of it as a gangrene

Causes of Inflammation.—If it were not for the sticklers for detail we could say as Senn did, that all inflammations are due to infection. To encompass the whole truth, however it must be added that irritation by chemical substances such as croton oil and turpentine may produce an inflammation, and physical agents particularly rays of light, notably the actinic rays which roentgenologists know to their sorrow heat and cold can produce reactions in tissue which produce the general effect of inflammation. If one wished to be exact in the discussion of this problem, more space would be required than is available

For the purposes of this study it may be said that the entrance of bacteria into the body is the cause of inflammation. The avenues whereby they enter the tissues are most varied. Any abrasion of the surface whether by accident or intent admits bacteria unless the surface has previously been prepared. The manner of infection has much to do with the course Clean incised wounds free from exudate furnish the poorest field for the development of bacteria Foreign bodies augment it Lacerated wounds where there are many pockets for the accumulation of exudate aggravate as do deep puncture wounds. Much trauma about the wound adds to the disturbance

INFLAMMATION AND INFECTIONS

Generally speaking, inflammation and infection are synonymous terms. An *infection* in the *surgical sense* is characterized by the advent of inflammation. It is convenient to consider inflammation as a *general* process, which under certain modifying conditions takes many specific forms, varying between a boil and a generalized septicemia. A knowledge of the general process is necessary *before* one can understand the numerous variations.

Inflammation

Ordinarily when the surgeon thinks of disturbed wound healing, he conceives of bacteria having entered the wound, and by the elaboration of their product to have so disturbed the tissues that healing cannot take place. The process so simply stated is in reality a very complicated one. *Once the bacteria have entered, their products* irritate the tissue and produce the death of some of the cells or change the chemistry of some of the *tissue fluids*.

In *response to* this injury certain definite and well-ordered phenomena take place. The vessels dilate and the blood stream becomes more active. This is made manifest by an increased redness of the part and is often perceived by the patient as a throbbing. *Following* this dilatation of the vessels serum exudes from their walls and leucocytes escape into the surrounding tissues. This produces a swelling of the affected parts. As the part swells the surface heat increases. Whether this heat is caused by the more rapid circulation *of blood* due to the dilatation of the vessels or whether there is a local increase of heat production is not known. At any rate, the temperature of the affected part is never above that of the interior of the body as was shown by John Hunter *more than a* century ago. How deeply the whole body is concerned in the escape of leucocytes is made obvious by the development of leucocytosis in which the entire body blood shows a marked increase of leucocytes.

may hope to curtail its progress We can lessen the congestion by elevating the part, if a limb is affected, and we may lessen the congestion by applying cold or by use of chemical astringents such as lead acetate Even though these agencies do not stop the inflammation in its course, they may serve to lessen the intensity of the suffering It is only in the noninfective inflammation that these agencies may be looked on as actually curative.

Curative—Treatment to be curative would need to eliminate the infected focus. This is seldom possible. The most one can do, usually is to assist the process going on in the tissues Thus in the early stages the application of cold tends to contract the vessels, thus lessening the turgescence and in this way limiting the process. If this does not succeed the opposite is in order Heat is applied in order to dilate the vessels, thus hastening the breaking-down process which results in an abscess. This stage having been reached we can materially aid in summarily ending the trouble An exit for the accumulated pus is usually secured. Freed of the abscess contents, the tissues are relieved of the source of irritation. In order to be assured of this after the abscess has been opened, we must see to it that it remains so We secure drainage by means of gauze strips or rubber tubes, in fact any agency which keeps the wound open may be considered a drain When the abscess contents escape the process is no longer a defensive one but is reparative Newly formed fibrous tissue is formed to repair the defect and the patient recovers.

SUPPURATIVE INFECTIONS

Under this head may be considered the individual organisms which are responsible for special inflammatory processes. Among the most common are the staphylococcus, streptococcus, B pyocyaneus, coli, etc Combinations of these and other bacteria are commonly found. Such combinations may very materially alter the clinical picture The experienced surgeon can determine from the clinical course which of the various bacteria are the dominating factors. It seems fitting therefore to present a clinical picture which each of these produces.

Clinical Course—The symptoms above enumerated begin to manifest their presence within twelve to twenty four hours. The time of onset and the degree of disturbance produced depends upon the kind and character of the infection. Usually there is subsidence within two to ten days Since however, individual bacteria differ so much, this phase is best considered in the specific discussion of the individual bacteria groups

Infections tend to localize, that is to say, sooner or later defensive forces of the body succeed in perfecting a defensive wall about the invading host This implies the destruction of a part of the bacteria, but the part remains in the center still possessed of virulence but incapable of harm because of the wall of infiltration about them This center is made up of bacteria dead leucocytes, and serum that has exuded, together with the tissue of the part incorporated in the quarantine area. This is an abscess Some of the toxins escape into the circulation producing fever and the expansion of the tissues causes pain. The increasing volume of the contents causes a pressure which brings an extrusion and a sort of pressure necrosis of the surrounding parts Sooner or later the surface is reached and the abscess bursts and its contents escape With this the tissues are freed of the irritant substance and quickly heal

Treatment—The treatment of inflammation is divisible into prophylactic, palliative and curative.

The *prophylactic* treatment consists in minimizing the potency of the noxious agents Clean wounds are those in which the precautions are taken before the wound is made the instruments are boiled, and the skin area is rendered as nearly sterile as possible. In accidental wounds, however, complete preliminary disinfection is not possible and the wound as the surgeon sees it is infected The environment is shaved and scrubbed as though the wound had not yet been made The interior is mechanically freed from all visible foreign bodies Tags of tissue are trimmed away and all exudate checked as much as possible Whether or not any chemical disinfection is to be attempted depends upon conditions.

Palliative—Inflammation once in progress must be managed according to the character and stage Early in its course we

recently with Dakin's solution These attempts are necessarily futile as is clearly apparent to any one who had studied the histology of infected wounds

Boils (Furuncles) —Such distressing lesions as boils typify the local action of the staphylococcus Bacteria gain access to a hair follicle or sebaceous gland and set up a reaction Leucocytosis infiltration exudation of serum and dilatation of vessels begin. The skin at this point becomes elevated, producing the characteristic low pyramid Throbbing and pain begin and grow in intensity as the pyramid enlarges until the unhappy host emulates the lamentations of Job The central area of tissue dies and is loosened by the liquefaction of the surrounding tissue After the overlying skin has been opened by natural or artificial means the pus including the core escapes and healing begins. The possessor of boils learns to look for the advent of the core as evidence of the end of that particular trouble

Diagnosis —There is nothing more characteristic than a boil. But few patients fail to make the correct diagnosis, whether they can see the lesion or not The localized pyramidal swelling together with the pain leaves nothing to doubt There remains the determination of possible etiologic factors It is well known that diabetics are prone to the development of boils. Certain blood states likewise play a part Hence the state of the urine and blood should be determined in patients complaining of boils.

Treatment —When the patient has had a series of boils and a reddened area is detected about the shaft of a hair the beginning of a new lesion may be suspected. It is possible sometimes to abort its development by boring down the hair shaft with a needle the point of which has been dipped in carbolic acid. Excision of the entire lesion is more effective but leaves a small wound certain to be infected The repeated application of the tincture of iodine to a developing boil may somewhat limit its growth. In most instances, however its development to fruition is inevitable The best treatment is to bring it to this end as quickly and painlessly as possible Poulticing has been the practice since time immemorial this not only is disagreeable but tends to spread the infection to new areas by incubating the bacteria as they escape and macerating the surrounding skin so that

Staphylococcic Infections

The essential characteristics of infections by the staphylococcus is that they are localized. It is *exceptional for them to* cause a generalized infection The organism may gain entrance *through a* wound or *through the pores of the skin or abrasions* too small for detection These forms may be considered in turn.

Local Infection of Wounds—The ordinary accidental wound is *prone to become infected An exudate forms and the edges of* the wound become red and swollen There is usually some throbbing and if the wound is extensive, there may be some constitutional disturbances After an exudate has formed, if the wound has been sutured and the covering skin has healed, an *abscess is formed and must be opened. If the skin is not so* firmly united the abscess seeks escape on its own account and the abscess ruptures spontaneously

When the wound is not on a *tension there may be no pain* and the presence of infection must be determined by the presence of fever and leucocytosis. *There* may be no local reaction apparent on the skin and there may be no fluctuation until the accumulation of pus is considerable These conditions obtain in the ordinary accidental wound and in the wounds of operations as in hernias. Whenever there is fever and the patient has had a recent *wound it should at once be examined for possible* infection.

When an infection in a wound is suspected, it should be explored by passing a probe or small forceps between the edges of the wound the presence of pus is readily detected Once demonstrated the pus must *be provided with an avenue of escape* A stitch or two must be removed and the edges gently opened Usually it is not necessary to place a drain, and irrigations are useless. In these infections in which there is much reddening of the wound the entire wound should be opened and the edges kept apart by loosely packing with gauze This must be continued until granulation tissues spring up in the wound. After *this efforts may be made to* hasten healing by coapting the edges of the wound by suture or adhesive strips. Attempts at chemical sterilization of wounds *have been made from* time to time, most

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they may gain more ready access to its depth. There is no such objection to hot wet dressings of a saturated solution of boracic acid In the intervals between such wet compresses, the use of an ointment of salicylic acid of from 15 to 30 grains to an ounce of vaseline, depending upon the thickness of the skin and the age of the individual, spread thickly over the reddened area, is beneficial. The acid macerates the skin, making early rupture easier, is in itself an anesthetic and by its antiseptic properties tends to prevent the formation of new lesions in other regions Early incision before the time of abscess formation with the idea of shortening the process has been done but sometimes infection has spread beyond the point of original infection. Besides, the incision at this time is painful Once the interior has liquefied, there is no objection to incision. The summit of the boil may be frozen or the entire lesion may be circumscribed by a local anesthetic However the incision of boils about the lips and nose is positively to be interdicted.

Carbuncles are but a conglomeration of boils Several foci in close proximity undergo necrosis and each seeks a separate outlet. In this way an elevated, hard, blue-black lesion is produced. The constitutional disturbance is correspondingly greater The back of the neck and shoulders are favorite sites When they occur as they are prone to, in debilitated subjects death may take place from general sepsis

Diagnosis—The brawny induration, circumscribed and elevated, exceedingly sensitive to pressure, makes the diagnosis. In this affection even more than in boils, it is necessary to determine the general bodily health of the patient.

Treatment—The salicylic plaster or hot water compresses may be used until there is a tendency to liquefaction Then a crucial incision should be made and the triangular flaps so made should be undercut so that the whole interior of the lesion is exposed In some cases it is advisable to excise the entire area involved Either a scalpel or some form of electrocautery may be used Then hot antiseptic dressings should be applied. The general health of the patient should be supported and if the patient be diabetic, this condition must be combated with every resource

Cellular Abscesses.—Subcutaneous cellular abscess is often caused by the staphylococcus This may follow a trauma or be an extension from an infected lymph gland These are most often seen in the neck, perianal spaces and the like Their chief characteristic is a localized induration which tends to the formation of a localized abscess.

In such localized infections the nature of the infection is always problematic. The localized nature of the lesion, however aligns it in this group of diseases.

Streptococcus Infections

While staphylococcic lesions are prone to remain localized accompanied by much local reaction, streptococcic infections are characterized by a low degree of reaction, but little temperature disturbance by pronounced disturbance of the pulse and general well being Generally speaking the course is prolonged and the outcome is problematic.

Localized Streptococcic Lesions.—Localized streptococcic infections tend to remain small and indolent with little tendency to spread and equally little tendency to heal. There is little pain There exudes a thin sero-pus, small in amount and the scab formation is slow and imperfect

Their recognition is always problematic They are usually associated with other more rapidly growing organisms so that a cultural proof of their identity is often hard to produce. Clinically however the above picture is sufficient for practical purposes.

The local application of iodine seems to stimulate the tissues to reaction and hastens recovery More destructive agencies, such as formalin or the cautery may be used if the lesion is small and isolated.

Without there being demonstrable any biologic differences in cultures the various affections caused by the streptococcus show a markedly different clinical course. The localized abscess may show nothing striking save the indolence as above noted. Going out from these the greatest variety of associated lesions may develop The lymph channels may become involved and lymphangitis result or the diffuse erysipelatous involvement of the sub-

cutaneous tissues show in marked contrast. General sepsis or multiple metastatic abscesses may vary the picture

Lymphangitis—One of the commonest streptococcic infections is that seen when a small abrasion of an extremity resulting in a small indolent local lesion is attended by a red streak extending toward the trunk. Later the area of redness becomes indurated and tender The general symptoms may be absent or slight but usually there is a certain degree of weakness and apathy and generally some fever In more extreme cases the local trouble is only the forerunner of grave constitutional infections or metastatic involvement. The lymph nodes usually become swollen and very sensitive to pressure As a rule after a time the disease gradually subsides. Sometimes local abscesses form along the line of the lymph channel or in the lymph glands. Sometimes repeated inflammation of the lymph channels results in their obliteration by fibrosis. This may result in a general lymph stasis and an elephantiasic enlargement of the extremity involved

Diagnosis—The presence of a small wound and the red streak extending trunkward makes the diagnosis. Later the presence of enlarged and tender lymph nodes is confirmatory evidence.

Treatment—As soon as the diagnosis is made the local lesion should be painted with iodine and the limb placed at rest. Hot applications of plain water or antiseptic solution are usually used. The chief factor however is the proper management of the local lesion and rest of the affected parts If abscesses form they must be opened

Erysipelas.—Erysipelas is perhaps but an exaggerated manifestation of lymphangitis. Instead of the infection being confined to the lymph channels, the entire connective tissue area is involved Usually the local lesion is even less conspicuous than in lymphangitis and often no lesion at all can be found The disease may start, however in wounds of any magnitude Usually the disease begins in fifteen to sixty hours after infection with a chill and high fever a pulse rate of 160 and a temperature of 104 degrees are not at all uncommon. Simultaneous with these manifestations there is a redness and swelling about the site of infection. There is a boggy induration which terminates abruptly and in some cases, a formation of vesicles filled with

a straw-colored fluid. The most characteristic feature of the disease is the sharply defined indurated border The disease extends along the border at the rate of one to several inches a day After from five to seven days the part first affected begins to lose its induration and becomes noticeably softer to the touch and the color of the surface becomes paler In extensive cases one area may be clearing up while the disease is advancing in the opposite direction. In some instances several weeks or more may be occupied by this advancing and receding process I have seen the process extend from the region of the nose to the level of the knees. Complications are common, the most disastrous of which is the invasion of some serous surface About the face extension may reach the meninges or may invade the vessel linings and produce a thrombosis of the cerebral or other vessels. A peritonitis regularly follows an erysipelatous infection of the navel in the newborn, now happily a rare condition. A septicemia or a pyemia may be implanted on an ordinary erysipelas through thrombotic and embolic processes. Another more common though less fatal complication is phlegmon of the subcutaneous tissues. When this occurs the subcutaneous tissue becomes much indurated may pit on pressure or only a boggy feeling may be present As the disease advances, fluctuation develops. In very loose connective tissue these abscesses may extend rapidly invading wide areas if exit for the pus is not provided.

Diagnosis—The sudden onset with a chill, the fever and the indurated border are quite sufficient to warrant a diagnosis. Cellulitis may sometimes simulate it but there is a lack of the sharply defined indurated border so characteristic of erysipelas. Then cellulitis may complicate erysipelas or erysipelas may be implanted on a cellulitis. Confusing erysipelas with eczema is unwarranted for fever and advancing border are never a part of eczema and seldom is there an enlargement of lymph glands

Treatment—Erysipelas is a self limited disease. Measures have been employed to limit its spread. Painting a line in advance of the spreading border with pure carbolic acid and after half a minute neutralizing the acid with alcohol has been recommended and I have repeatedly seen the advancement cease simultaneous with

Scarlatinoid Erythemas.—In a variety of infections there is an eruption not unlike scarlet fever. It is attended by fever often with delirium, which may mask the cause of the trouble. This is particularly likely to be true in osteomyelitis in which the disease overwhelms the patient before the local lesion becomes manifest.

The local throat symptoms are usually absent and the characteristic scarlatina eruption of the face is wanting, notably the white area about the nose and lips. The most pronounced eruption is usually about the trunk. These peculiarities and the absence of an obvious source of contagion should put the attendant on the alert for some local sign of infection. Whenever a scarlatinoid eruption is present, particularly in sporadic cases, careful search should be repeatedly made for some possible source of septic infection. If this rule is followed many cases of osteomyelitis will be discovered before the disease has advanced to fatal sepsis. The treatment is that of the source of the infection. If an osteomyelitis is discovered exit for the pus should be provided at once.

Generalized Infections

It is perhaps somewhat unjust to attach the generalized infections to the account of the depredations of the streptococcus because the staphylococcus, pneumococcus, coli and occasionally others are accountable, but the point remains this organism is the most commonly found and its work is the most deadly. It is the usual practice to separate generalized infections in two groups: the one in which the blood stream is overwhelmed by bacteria and their products without the formation of localized abscesses, septicemia, and those in which there is a formation of secondary abscesses in the various parts of the body, pyemia. This division is not altogether a good one for what begins as a septicemia may soon be complicated by the formation of secondary abscesses and thus become a pyemia. And, too, in many infections bacteria may be found in the blood yet not in sufficient numbers to produce a sufficiently profound constitutional condition to warrant its being called a septicemia. These terms are on the whole relics of the past and one must make the best of it, else much of the literature of the past will become unintelligible.

Septicemia.—By septicemia we mean the entrance of bacteria into the blood stream without the formation of metastatic abscesses This results when there is an infection of such character that it overwhelms the resisting powers of the body, or lesser infections in a body which lacks powers of resistance The classical example is puerperal fever Wounds received while performing autopsies or while operating sometimes run such a course Usually there is little wound reaction. The patient begins with a violent chill followed by high fever Often there is delirium The subsequent course may resemble a typhoid fever In severe cases death may result in twenty four to forty-eight hours If the disease is more drawn out, the patient may become yellow and undergo rapid emaciation.

Diagnosis—When constitutional symptoms out of proportion to the local symptoms are present in any infected wound, one may suspect the presence of septicemia. It is only by making a blood culture and demonstrating an organism that the diagnosis can be proved

Treatment—The focus of infection must be rigorously treated by wide incision General supportive treatment must be followed It is more than questionable if vaccines are of any service.

Pyemia.—If bacteria after gaining access to the blood stream produces local foci of infection, this constitutes a pyemia The preliminary symptoms may not be recognized as a septicemia, the local abscess being the first intimation of the nature of the disease Osteomyelitis may be regarded as the most common type of this condition. Joints frequently become involved in sequence of acute infectious diseases tonsillitis and influenza being perhaps the most common. After puerperal septicemia abscesses in the lung and joints were common. Frequently in the course of septicemia great irregularity of temperature marks the beginning of secondary foci. The temperature may be normal for the greater part of the day when a sudden chill followed by high temperature changes the picture

Diagnosis—When in any septic process marked irregularity of temperature with or without chill supervenes the likelihood of a secondary abscess must be recognized. No clue as to the possible localization is given by these phenomena. The solution can

be made only by constant search for the localizing symptoms Pain, tenderness possibly fluctuation, must be sought

Treatment—Once the localized infection is found, drainage must be instituted. If this is not followed by relief of symptoms other abscesses must be sought

Pyocyaneus Infection

The Bacillus pyocyaneus gives rise to an infection peculiarly persistent and characterized by the production of a distinctive sweetish smelling greenish pus. It is particularly likely to be found in injuries to the extremities or as a complication of an abdominal infection notably appendicitis Such infections are characterized by their obstinacy

Diagnosis.—In all stubborn suppurations the presence of this organism should be suspected, and if the characteristic greenish pus is not present the bacteriologic demonstration of this organism should be attempted

Treatment.—Once recognized, this infection is easily controlled by packing the wounds with gauze moistened in a saturated solution of aluminum acetate or one per cent solution of acetic acid. It is in these cases that the old poultice of vinegar and salt gained a deserved reputation.

Tetanus

Infections of wounds by the bacillus of tetanus has played a most somber rôle in the history of wound infection. The bacillus of tetanus being an anaerobe it is usually the penetrating wound chiefly of the foot or hand that suffers. Since it is an inhabitant of the soil, a nail that has laid out in the open is the most fruitful source of trouble The blank cartridge pistol also has exacted a tremendous toll. From four to fourteen days after the receipt of such an injury the patient begins to feel sick and notes a stiffening of the motor muscles. The masseter are usually the first to suffer hence the popular synonym lockjaw' Following this there is a stiffening of the neck muscles, then those of the back and finally those of the entire body At the height of the disease at intervals often with the slightest provocation, as in gently touching the bedclothes the entire musculature of the

patient is thrown into a violent spasm Sometimes the spasm of the respiratory muscles is so violent that the patient dies of suffocation. As the disease improves, the spasms become less frequent and less violent. Some stiffness and soreness may persist for several weeks or more

Diagnosis—Sometimes the original wound has healed and the *patient does not mention it in his history* *Pain in the masseter* muscle or parotid region should always excite a suspicion, and if there is an actual inability to open the mouth, a possible wound should be sought.

Treatment.—Prophylactic treatment fortunately has lessened enormously the incidence of this disease Whenever any wound is presented which might harbor such an infection, a prophylactic injection of serum usually 1500 units, should be given. All wounds made by objects in contact with the soil should be regarded with suspicion. In addition to the giving of the serum the wound should be opened so that all parts of it may be reached by a chemical or other cautery

The curative treatment is much less impressive It is likely to be successful according to the date of onset. Those beginning on the fourth to sixth day are likely to result fatally no matter what the treatment, while those beginning from the tenth to fourteenth day are likely to recover irrespective of the treatment *employed* *The first step in the treatment is to thoroughly destroy the focus of infection.* If a finger has been badly mangled amputation may be considered but the amputation of an arm or leg is not warranted because of the uncertainty of its value. Chemical or the actual cautery should be freely applied to the wound if it cannot be completely excised Nitric acid is a convenient and effective means

To the patients seen early in the disease *15,000 to 20 000 units* of antitetanic serum should be given intravenously at once and 6000 to 10 000 should be given intraspinally at the same time. This is usually sufficient but may be repeated in a week if it is necessary If seen later in the course of the disease, 30,000 to 40 000 units of the serum should be given intravenously and 10 000 to 12 000 units intraspinally Chloral and bromides should be given by mouth or by rectum until *effects are produced.* The nutrition and fluid intake of the patient should receive attention.

To control severe convulsions magnesium sulphate may be given intraspinally It should be given in the form of a sterile 25 per cent aqueous solution. The dose is 1 c c. for every 25 pounds of body weight This amount usually relieves for twenty four to thirty-six hours and it may be repeated several times if necessary It may be possible to diminish the dose without lessening the effect. The dose should never be increased Sometimes prolonged paralysis results, but this is of minor importance so long as the patient escapes death from the disease.

NONSUPPURATIVE SURGICAL INFECTIONS

Under the caption of nonsuppurative surgical infections may be considered certain conditions toxic or infectious which are not attended ordinarily by the production of pus First among these are certain toxic conditions of more or less importance as insect bites, snake bites and poisons by certain plants Following this are the so-called granulomatous processes, infections which produce granulomas but no pus. These are of double importance since they resemble pyogenic infections on the one hand and neoplastic processes on the other

Insect Bites and Stings

In these conditions, either from the bites and stings of insects, certain toxic substances are introduced into the body which are attended by more or less local and sometimes general reactions Among the first are bites by mosquitoes and bedbugs. Among the stinging insects bees, wasps and hornets are most common. In the former intense itching is characteristic while in the latter a burning pain with more or less marked swelling is the common symptom. Occasionally more serious consequences follow When many insects sting an individual in close succession or if a vein is penetrated by the stinger general symptoms such as superficial breathing rapid pulse faintness vomiting and collapse and in rare instances, death may supervene

Diagnosis —Usually the history is characteristic The individual gives a graphic account of the reception of the injury Occasionally however the source of the sting is unknown and in small children the history may be incomplete In such cases the

stinger may still be in position and may be readily identified. If not, the small wound may be discovered Otherwise the swelling of rapid onset, smarting pain and absence of inflammation is suggestive

Treatment.—The poison from all these sources is supposed to be an acid and mopping the affected area with ammonia is a logical and more or less effective antidote. The swelling may be controlled with lead acetate and opium solution. In some instances an *infection supervenes and a local abscess results* These must be treated as any local infection, salicylic plaster, later possibly incision

Snake Bite

Bites by *reptiles in this country are confined chiefly to the* single species the rattlesnake The action of the venom is to destroy rapidly the red corpuscles Immediately after receiving the bite swelling begins and spreads rapidly, and a certain burning pain at the site of injury is complained of At first the swelling *is colorless, but soon it becomes mottled from petechial hemor*rhages Later the lymphatics and vessels become thrombotic, and local or more general gangrene may follow A sense of weakness rapid pulse dyspnea, vomiting a sense of terror and collapse is the order in which the general symptoms develop Death *may supervene within a few hours from direct overwhelming by* the poison but may be delayed for a week or more and then is caused secondarily by the destruction of blood cells. Usually the nearer the central organs the bite the graver the condition If a vein is penetrated by the teeth of the reptile the condition is particularly grave Bites in the faces of children are always fatal injuries

Diagnosis.—Usually the history of the condition is clear enough In small children this is not true One small tot exclaimed A kitty bit me and collapsed into a fatal unconsciousness. In such cases *two wounds a centimeter apart* is the telltale mark and this is made plainer when the swelling and mottling appear

Treatment.—When a case of snake bite is first seen the instinctive thing to do is to apply a tourniquet Most laymen know how to do this, but it is usually applied so tightly that the venous flow is checked This is *done on the old theory that absorption is by*

way of the blood stream Jackson has shown that absorption is by way of the lymphatics, and that the constriction should be just tight enough to obstruct the lymphatic but not the venous flow

In most cases absorption is by way of the lymphatics. Jackson has shown that the poison reaches the venous system by way of the lymphatics and thoracic duct Lymph is poured out into the region in which the poison has been injected This furnishes the chief clue to the treatment—the local abstraction of the lymph diluted poison by suction.

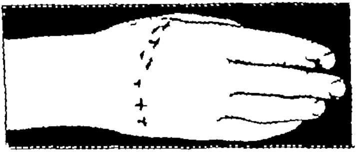


Fig 61—Series of cross-cuts encircling the limb above the site of the bite. (From Jackson Texas State J Med, July 19 7)

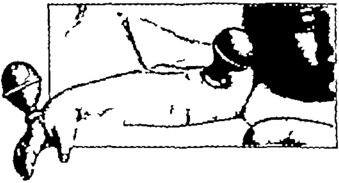


Fig. 62—Illustrating suction bulbs in place on the arm of the child, who was bitten by a small rattler (From Jackson Texas State J Med., July 19)

In order to achieve this, besides the usual cross-cut generally recommended at the point of the reptile's tooth a series of cross-cuts one-fourth inch long and one-eighth inch deep are made about the circumference of the limb (Fig 61) To these points of incision suction is made, preferably by some suction apparatus—Bier s pump (Fig 62) or breast pumps or Sorensen's apparatus when available If swelling continues beyond the line of incisions, a secondary line must be made and suction made as before. Jackson recommends that suction be made once every hour for

ten to fifteen hours, for twenty minutes cupping first over one incision and then over another Between treatments the limb is kept wrapped in hot fomentations, either bichloride of mercury (1 to 10 000) and magnesium sulphate or sodium citrate Anodynes are given for pain. Blood transfusions are recommended if the red count drops below 3 million Saline cathartics and colonic irrigations are given every four hours.

Antivenin has been much written about and is, no doubt, of value and has the power to neutralize the venom once it gains *access to the circulation*, however, *too much reliance should not* be placed on it Too often the antivenin is not available when *needed Col Crimmins has estimated that a syringeful of anti* venin will neutralize only about 10 mg of venom while the average Texas rattlesnake can inject 220 mg of venom, It is evident that a large amount of antivenin would be required to neutralize the entire amount Even if antivenin is available, the suction and other measures recommended by Jackson are to be assiduously applied

Glanders

Glanders is common in horses in some regions and occasionally affects man It manifests itself by the production of localized indurations usually about the nose eyes and face, that tend sooner or later to break down.

Diagnosis—Rapidly developing inflammatory lesions in the regions indicated in individuals having the care of animals affected with this disease should excite suspicion *If the indurated* areas break down forming deep ulcers with overhanging borders the *diagnosis may be made with considerable probability*

Treatment.—When possible the lesion should be excised and the resulting wound cauterized If this is not possible free drainage should be made and the resulting wound packed with 1 to 200 solution of formalin in water Usually treatment is of no avail

Actinomycosis

Infection by the ray fungus is more frequent than is usually suspected It is most often seen in those who have much to do with cattle It is most commonly located about the face and neck but may occur in any part of the body even in the *internal or*

gans. In any indolent lesion this disease must always be considered It usually begins as a slowly developing inflammatory process, most often about the face or in the mouth not infrequently in the chest and abdomen and sometimes in the extremities. After a variable period from one to several months the lesion softens and bursts on the surface spontaneously and discharges a granular pus The pus granules are often a canary yellow color, but may be dirty white These when crushed present the ray fungus on microscopic examination. Not infrequently the disease begins as a superficial ulceration of the jaw closely resembling carcinoma

Diagnosis.—The discovery of the canary colored granules is usually given as the pathognomonic sign. So it is, but in many cases no such objects are found They are often a dirty grey not unlike the small masses in tuberculous pus. In these the demonstration of the fungus is necessary not always by any means a simple task Frank Hall states that when actinomycotic pus is crushed between two slides as in making a blood smear but in the reverse direction, a grating is felt as if fine particles of sand were being encountered, and this is pathognomonic of actinomycosis This disease must be differentiated from other chronic inflammations, notably tuberculosis. It is found in the vigorous, most commonly in regions where tuberculosis is not common. Most characteristic however, are the crateriform sinuses which remain. These are all but pathognomonic (Fig 63) The chronic ulcers and sinuses in tuberculosis usually present a soft patulous ulcer without the tendency to scar formation characteristic of actinomycosis In actinomycosis, too there are usually several points of exit while in tuberculosis there is but one. Deep lesions, especially those about bone as about apical abscesses in the lower jaw, leave a chronically discharging sinus. These are single and usually the etiologic factors are evident from the history Here however nothing should be taken for granted, and the bone lesion should be demonstrated. In the more deeply lying lesions, as in the abdomen or chest, often a diagnosis is not made until the lesion is cut into and the granules are found.

Treatment.—Potassium iodide internally is the most effective treatment. It is given in as large doses as the patient will bear for a period of ten days, and then treatment is suspended for a like period and again resumed in doses the size administered at the time the drug was suspended. Usually 30 grains a day may be taken as the initial dose. This should be rapidly increased until the patient is taking 120 grains or more a day. Some pa-



Fig. 61.—Actinomycosis.

tients will take as much as an ounce a day. Injection of a dilute iodine solution, as Lugol's solution, directly into the affected tissue has served us well though this treatment is denounced as useless by many. Pain is caused by this method, but it places a concentrated solution at the point where it is most needed. The x ray has been found useful. When there is a considerable ac-cumulation of pus the lesion must be freely opened and drained. The wound should be freely swabbed out with tincture of iodine

and the wound packed with gauze soaked in Lugol's solution. Deeply-seated lesions as in the abdomen must be freely drained and packed, preferably with iodoform gauze

Hydrophobia

Hydrophobia is caused by an infection from the bite of a rabid animal. Dogs are the offending animals in the vast majority of cases, but other animals may be affected notably cats squirrels skunks coyotes and jackals The entrance of mouth secretion into a fresh wound is the essential to infection hence the necessity of guarding fresh injuries when dealing with patients affected with this disease The disease begins usually four to six weeks after infection, but has been known to begin as late as six months. The prodromal symptoms are headache loss of appetite insomnia and a peculiar restlessness The wound area is said to become reddened tingling with shooting pains along the line of the chief nerve trunks also has been noted The actual advent of the disease is marked by intense thirst with spasms of the muscles of the pharynx when an attempt is made to drink. Later on these cramps come on at the sight of water and finally there is a constant spasm Spasms of the respiratory muscles follow At the height of the disease the slightest touch of the clothing brings on these intense cramps After a time the spasms subside and are followed by paralysis, delirium, and fever Some times fate is less kind and the victims retain consciousness until death by paralysis closes the scene From three to six days are usually required for the disease to run its course This disease is the most terrible to which animal flesh is heir and he who has once witnessed a patient suffering from it will never quite regain his composure

Diagnosis—Once the spasm of the pharynx begins the diagnosis is fairly easy if one thinks of the possibility of this disease Often there is no history of the bite of an animal and one may not think of this possibility Once the intense spasms begin the diagnosis is unmistakable Very early one may think of tetanus But the spasm of tetanus is a masseter spasm and not one involving the muscles of the pharynx

Treatment.—There is but one element in treatment prophylaxis Once the disease begins an all too long delayed termination *is inevitable* When an animal is believed to be rabid it should be confined If rabid it dies within ten days If it recovers, it was not affected by rabies. Usually the animal is shot as soon as it is suspected of being mad. It is then proper to send the head and neck of the animal to a competent laboratory to be examined for Negri bodies This places a heavy responsibility on the technician and few men care to take the *responsibility of* a negative report, I have never known one to do so Therefore, if infection is proved or suspected the Pasteur treatment should be instituted This furnishes an almost certain prevention. The patient had best be sent to a laboratory where men experienced in this treatment are available If this is not possible many laboratories send out the treatment with specific directions for its use When the disease begins, *any measure that will mitigate the terrible suffering* should be used. I once gave two grains of morphine to a ten year-old boy before the spasms began to relax

Tuberculosis

The phases of tuberculosis coming under the province of minor surgery consist chiefly of the management of abscesses and fistulas and certain superficial lesions These may be considered in turn.

Abscesses—The most common site of tuberculous abscesses is that of the cervical lymph glands. These glands frequently, after some months soften and not infrequently open of their own account. The resulting scars are thick and unsightly These are the so-called scrofula scars of our ancestors If they come under observation before rupture it is well to aspirate their contents and inject a small amount of iodoform emulsion. Usually this results in the abscess opening spontaneously later on but if it succeeds in preventing spontaneous opening much time and scarring are saved The needle should approach the abscess at the bordering normal skin and reach the abscess obliquely The channel collapses after the withdrawal of the needle, preventing the escape of the iodoform-glycerine emulsion and also prevents the entrance of pus organisms Once the abscess has

ruptured, the opening may be widened and the interior curetted and cauterized This usually results in healing When more deeply seated lesions as in carious bone, form an abscess the management is the same aspiration and the injection of iodoform glycerine. Spontaneous perforation is to be avoided if possible because mixed infection is an accident of some consequence.

Fistulas—Fistulas usually arise from some deeply situated lesion most commonly of bone Healing is dependent on the



Fig. 64—Tuberculosis.

eradication of the lesion. When this is of the bone some major procedure is required to relieve the condition. The use of iodoform emulsion injected into the sinus or into the tissues, however often produces remarkably good results These measures are more generally useful than the injection of Beck s bismuth paste though in suitable cases the bismuth method succeeds.

Superficial Lesions.—Superficial tuberculous lesions are apt to begin in the skin producing livid blue lesions which sooner or

later produce superficial ulcerations. These ulcerations are characterized by the soft overhanging skin borders (Fig 64) These retain their blue color The base of the ulcer is flat, covered by a pale pink, sluggish granulation tissue These ulcers are distinguished from carcinoma by their situation and by the softness of their borders and the absence of their kidney shape These heal after a time under stimulating or destructive treatment. The cautery is usually the best treatment

Syphilis

Superficial syphilitic lesions which concern the surgeon are almost entirely confined to ulcerations of the soft parts When the skin involved covers bone a periostitis is associated with the skin lesion. This is seen particularly in the scalp and shin. These superficial lesions may occur on any part of the body and at any age These ulcers possess certain fundamental characteristics that are usually pathognomonic The kidney shape of the lesion, or the reniform arrangement of the grouping when there are several lesions, is characteristic (Fig 65) The relatively rapid onset distinguishes them from both tuberculosis and *epithelioma*

When lesions are painful, as when the periosteum is involved they exhibit their greatest pain at night Usually the patient vociferously proclaims this fact of nocturnal exacerbation without being questioned They are also tender to pressure characteristics which are particularly impressive when the patient is in bed These are characteristic of syphilitic periostitis. Periosteal syphilis is easily recognized by the x ray The periosteum is thickened for long distances

Diagnosis—The form of the lesion the location the onset and in bone lesions the x ray are the factors which must be depended upon for the diagnosis. When the presence of syphilis is probable the therapeutic test is the most reliable guide These means are more reliable than the Wassermann reaction, though of course this test is now made in all cases where syphilis is suspected but he is a wise physician who knows when to ignore its testimony Only he is a good doctor who can diagnose syphilis without the history of infection or the laboratory report The

patient may lie, the laboratory may err, the lesions alone tell the truth

Treatment—Mercurial ointment locally and potassium iodide internally or salvarsan cause disappearance of such lesions in a very few weeks This therapeutic test is the most reliable cri



Fig. 65.—Syphilis.

terion we possess Syphilis resists this treatment but rarely and occasionally other lesions recover during the period of treatment but the manner and speed with which superficial lesions heal under this treatment is all but pathognomonic of syphilis.

Blastomycosis

Blastomycosis is a chronic ulcerous disease involving chiefly exposed parts of the body but may occur elsewhere It usually

begins as a papule which becomes pustular From this the lesion spreads peripheralwards There results a reddish blue coarsely granular surface which is covered more or less by secretions or encrustations (Fig 66) The lesions vary in size from a dime to the size of the palm or even larger They are usually irregularly ovoid but may be irregular Sometimes deeper ulcers form and in rare instances the disease involves deeply lying organs *The disease is very chronic, often lasting many years* In some

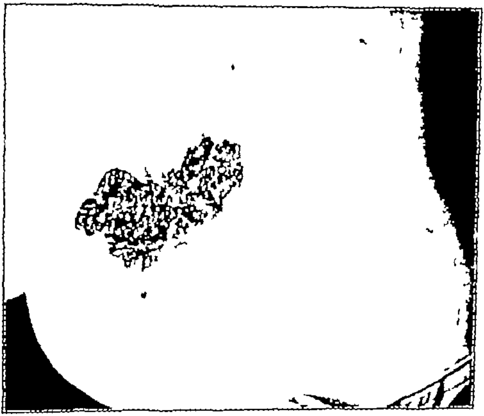


Fig 66.—Blastomycosis of the lumbar region.

instances it heals in one part while extending to another The scar thus formed is thin pale and unelastic

Diagnosis—Its great chronicity is suggestive From tuberculosis it is distinguished by the large blue-red granulations with little tendency to actual ulcer formation The form sometimes suggests syphilis, but is more chronic and does not form the punched-out ulcers characteristic of syphilis The final proof of the diagnosis consists in the demonstration of the blastomyces.

Treatment.—Large doses of potassium iodide is the usually prescribed treatment The x ray has been much lauded When these fail, excision, preferably with the cautery, should be done The ulcers thus resulting may be covered with skin grafts after healthy granulation has formed.

Sporotrichosis

Sporotrichosis is due to infection by the sporothrix Infection usually gains entrance in a small wound on the finger or hand, much less often on the foot. It is characterized by the formation of small indolent abscesses just beneath the skin (Fig 67) After a time they tend to break through the skin discharging a thin pus. From the original lesions others form extending along the course of the lymph channels. The original focus is re-



Fig 67 —Sporotrichosis. Some of the lesions have been incised because of a mistaken diagnosis.

peated until a chain extending up the arm is formed. The axillary lymph glands may finally become affected. The disease is chronic, lasting many months unless cured by proper treatment.

Diagnosis—Once the clinical picture is known, there is no difficulty in diagnosis. The long string of suppurative lesions is wholly typical. When there is a solitary lesion it may resemble a slowly healing streptococcic infection or a skin tuberculosis though the latter is usually more superficial and of slower development. The demonstration of the sporothrix is the final proof.

Treatment.—The organism being anaerobic, covering the lesion with an ointment to exclude the air is the first step in treatment. The use of potassium iodide internally is a specific If many abscesses have formed they should be opened. If the

above treatment does not produce a cure, injection of iodoform glycerine beneath the lesion causes its disappearance in a few days

Tularemia

Tularemia is rather a newcomer in the clinical nosology It is a specific infectious disease due to the *Bacterium tularense* and is acquired chiefly by the handling of infected rabbits.

At the present time there are four recognized distinct clinical types of the disease The period of incubation averages three and a half days.

1 **Ulceroglandular Type** —This is the most common type and probably two-fifths of all reported cases belong to this group

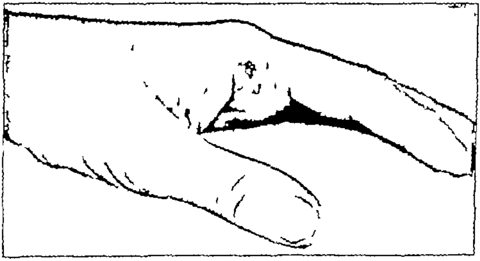


Fig 68.—Ulcer of tularemia. Note the indurated raised border

The primary lesion is a papule which becomes painful and swollen, breaking down in the center liberating a necrotic core The edges of the ulcer are raised and have a bluish color (Fig 68) The ulcer is very slow in healing and is finally replaced by scar tissue Within forty-eight hours after the appearance of this papule the patient complains of pain in the regional lymph glands draining the site of infection and on examination there is a redness overlying the glands which are readily palpable and tender Red streaks may be seen extending from the site of infection up to the enlarged glands About 50 per cent of the glands go on to suppuration and with the subsidence of the inflammation an abscess forms which either ruptures or should be lanced In the

other 60 per cent of cases the glands remain enlarged, hard and tender for two or three months, gradually returning to normal

2. **Oculoglandular Type**—The primary site of infection in these cases is in the conjunctival sac, caused by the rubbing of the eyes with contaminated fingers The eye presents signs of irritation, lacrimation edema of the lids and adjacent tissues, edema and hyperemia of the ocular conjunctiva, and one or more papules on the lower eyelid There is likewise a painful enlargement of one or more of the following lymph glands parotid, preauricular submaxillary anterior cervical and even the axillary group in the more severe cases Tiny well-defined ulcers soon make their appearance on the conjunctivae of both upper and lower lids Constitutional symptoms are associated

3 **Typhoid Type**—Fever is the outstanding symptom in this type there being no primary lesion or regional adenopathy and a diagnosis is dependent upon probable exposure and the general symptoms.

4 **Glandular Type**—Enlargement of regional lymph glands together with the characteristic constitutional symptoms, but without evidence of any primary lesion, characterizes this type

General Symptoms—There is an initial rise in temperature which lasts one to three days, then there is a remission for from one to three days and again a secondary rise after which there is a gradual decline to normal This curve is suggestive

The white blood count is but slightly increased, but has been found as high as 16 000

A macular papular pustular maculopapular papulopustular blotchy or a diffuse rash has been observed Usually painless with no itching Desquamation and pigmentation have been observed.

Convalescence is very slow Even after recovery there is a persistent general weakness. Some have not returned entirely to normal until a year has passed

Prognosis—Twenty four deaths out of 679 cases have been reported Bronchopneumonia lobar pneumonia meningeal involvement general peritonitis and kidney complications have been found in those patients who died

Diagnosis.—Tularemia has been confused with typhoid fever influenza pneumonia Malta fever tuberculosis, and sporotrichosis. The diagnosis is made on the following six points 1 A history

of having dressed wild rabbit or of being bitten by a fly or tick 2 Primary skin lesion which is persistent, or by ulcers on the conjunctiva 3 Persistent adenopathy in region draining site of primary lesion 4 Fever of from two to three weeks' duration 5 By obtaining an agglutination of *Bacterium tularense* by blood serum collected after the first week of illness. 6 By isolation of *Bacterium tularense* by guinea pig inoculation from material taken during the first week of the primary lesion or from the enlarged glands.

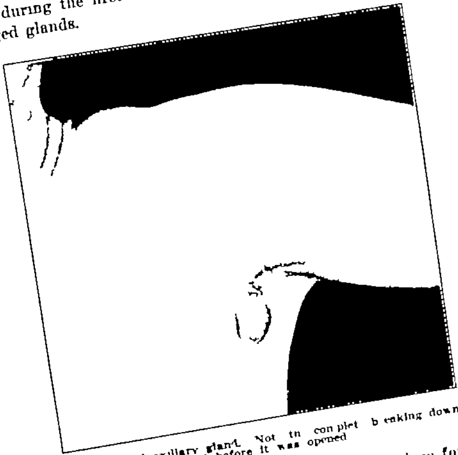


Fig 69—Suppurated axillary gland. Note the complete breaking down of the gland before it was opened

Treatment.—In cleaning rabbits and preparing them for cooking rubber gloves should be worn Immune people should be employed in the dressing of rabbits Ordinary disinfectants have been found effective The treatment is symptomatic and rest in bed should be stressed and carried out The glands should not be excised or incised until there is absolute evidence of softening and a thin place (Fig 69) appears over the glands No vaccine serum or drug has been found to have any curative value

CHAPTER V

AFFECTIONS OF THE SCALP AND CRANIUM

The cranium is subjected to many injuries both major and minor It often requires a nice discrimination to determine to which category an injury belongs Indeed, often the determination of which it shall be, depends upon the medical attendant, the neglect of a minor injury may convert it into a major one. The diseases involving the scalp are many and their determination requires a working knowledge of many diseases. Medical dermatologic and surgical diseases are encountered in a variety scarcely equaled in any other part of the body In versatility neoplasms rival even the other diseases and the oncologic expert finds enough to try his skill

Injuries.—Though the same accident may involve the scalp and skull as well as the cranial contents, it is convenient to consider the parts separately

SCALP

The scalp is the seat of frequent injuries which not infrequently end in infections of greater or lesser degree They may be conveniently divided into abraded contused, and severed wounds according to their severity

Abrasions

Many superficial injuries scrape off the epithelium of the skin leaving an oozing surface The average small child usually presents one or more of these for exhibition So well is the scalp supplied with blood that these are seldom matters of moment Any indifferent treatment either a bland powder or an ointment is sufficient as a protection. As a matter of fact these do better without any dressing at all being merely daubed after being cleansed with alcohol with iodine or mercurochrome The iodine coagulates the exuding serum and this when exposed to the air proves an excellent protective dressing Such a plan

has very obvious advantages in the treatment of injuries of small boys In dignified persons dressings of gauze held on by collodion or a bandage according to the importance and dignity of the patient, may be used. If these injuries are the result of falling on a cinder-covered walk or if by any other means foreign bodies have become imbedded in the surface, these must be removed mechanically, with gauze, a brush or sometimes with forceps and scissors, before the wound is treated and the dressing applied.

Contusions

Contusions are the familiar bump' on the head which follow blows by a blunt object or which are the result of striking the head against an object. These result in a more or less hemispherical mass because of serous exudate which shades off indefinitely into the surrounding tissue Sometimes there may be more or less hemorrhage into the tissues producing the familiar 'black and blue' spot. Hemorrhages into the substance of the scalp are usually small and irregular and move with the scalp These are usually of little consequence because they disappear in a few days Their significance lies chiefly in what may come of them and what they may conceal Sometimes they suppurate and then the abscess must be drained

When the escape of blood takes place between the periosteum and the bone, a considerable hematoma may form When the hematoma is fresh, the soft center may be surrounded by a ridge that may be mistaken for an edge of bone giving rise to a supposition of a depressed fracture This is particularly likely to be true several days after injury after cell infiltration at the borders may have had time to form. This subject will be further discussed in the section on fractures of the skull.

The classical example of blood cysts under the scalp is seen in the cephalhematoma of the newborn. Owing to some traumatism in birth, the periosteum is loosened from the bone and a cavity filled with blood results The hematoma is usually limited by the borders of one of the bones usually the parietal the close adhesion of the periosteum to the bone at the suture line limiting the extension.

Left to themselves such hematomas usually recover spontaneously by absorption within a week or two Their recovery may be hastened by aspiration or drainage. The objection to any active form of treatment is that it is occasionally followed by infection. Generally speaking, spontaneous cure should be awaited in infants while in adults drainage should be instituted

Wounds

Scalp wounds are usually innocent because of the very excellent blood supply to the skin of this region. Intelligent management however is required to achieve this end because if these wounds *do become infected the result may be annoying and* even dangerous Once infection takes place a very serious condition may arise The importance of the infection depends upon the depth of the wound. If the wound reaches the periosteum, the space beneath the aponeurosis is opened and infection may spread widely while if the scalp only is injured, infection is seldom extensive or important.

Recent Wounds

Because of the ovoid skull to act as a background, even a blunt object may produce a lineal injury It is only when an irregular object strikes the head or an object enters and then tears out that the wound is likely to be seriously complicated. Glancing blows may tear the scalp from its mooring for considerable distances.

As in all wounds, the first act is to thoroughly cleanse the wound and its environs. The hair must be shaved an inch about the injury and the whole area again scrubbed If the edges of the wound are ragged the irregularities must be trimmed off or if they contain foreign bodies, these must be removed by mechanical means. Before this is begun the edges should be anesthetized by local anesthesia either by sticking the needle through the cut edge of the wound (Fig 70-*A*) or by infiltrating an ellipse about the injured area (Fig 70-*B*) The latter method should be selected for all except the simplest wounds. It cannot be emphasized too strongly that the wound should be

thoroughly examined for foreign objects. Hair matted together by blood clots commonly is found in the wound, but sand cinders, and bits of soil are not infrequently found in wounds that appear clean on superficial inspection I once found at autopsy a piece of brick as large as a split marble which had been overlooked by the attendants who closed the wound.

After the wound has been thoroughly prepared the bleeding must be controlled and the edges coapted If there is bleeding from vessels of considerable size these should be controlled by separate ligature Because of the thickness and density of the scalp this must be accomplished by passing a suture armed needle about it. Smaller vessels may be controlled by the skin

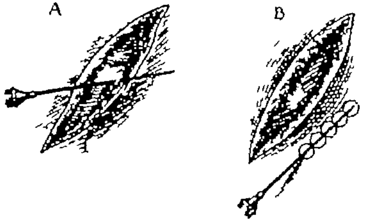


Fig [illegible].—Anæsthetization in wounds of the scalp. *A* The needle is introduced in the injured skin. *B* An ellipse is infiltrated about the wound.

suture The suture must go through the whole thickness of the scalp and must be knotted sufficiently tight to bring the edges into snug but not tight coaptation. The best suture to employ is fine silkworm-gut A figure-of-eight suture so passed as to include the bleeding vessel makes the hemostasis more certain If the injury is on an exposed surface as in the temple forehead or on a bald spot the sutures may be removed in forty eight hours in order to avoid scarring by the suture Otherwise they may remain four to five days. Clean wounds may be closed without drainage If however the scalp has been separated from the cranium for a considerable distance drainage should be used either at an angle of the wound or through a new opening made to receive it The drain should be of gauze

and may be removed in twenty four to forty eight hours. If the wound is a small one it may be covered with a collodion dressing but if it is large a large gauze dressing should be used and held in place by a scalp bandage

Infected Wounds

Wounds that suppurate after the above treatment has been carried out must have the sutures removed and the wound must be treated as an open one If already infected when it comes under observation the wound will be found to be gaping The environment must be studied in order to determine whether there is a cellulitis likely to result in a secondary abscess or if abscesses already exist at some distance from the wound or if but the infected edges of the wound must be dealt with It is well to observe carefully if there are any signs of intracranial involvement and if such exist a careful record should be made for the future protection of the attendants. If there is an acute cellulitis or perchance an erysipelas this must receive first attention In the very beginning cold applications may be used or perhaps still better a magnesium sulphate compress covered with an ice cap Later on, when breaking down is inevitable hot boracic acid packs are more gratifying to the patient and hasten the breaking down of the tissues In diffuse suppurating wounds loose packing of gauze moistened with 1:200 formalin solution or alcohol is better

Infected wounds should be searched for foreign bodies unless previously explored. If there is a violent inflammation, or even an erysipelatous one this may be deferred a few days until the reaction is under control unless it is obvious that such are present Unless one is sure of the presence of a foreign body the manipulation of the wound may aggravate the inflammation without a corresponding benefit

The complication most to be feared is extension of the infection through the skull into the dural vessels This is best prevented by keeping breaking down areas well drained. When the inflammation has subsided and there remains but granulating edges of the scalp wound these may be coapted by suture or adhesive tape.

Spontaneous Infections of the Scalp

Not infrequently infections appear on the scalp not the result of an accident. In undernourished children superficial abscesses may appear, often several at a time. They do not have the degree of reaction of a common boil nor do they end with a core. They resemble more a pus blister (Fig 71) or they may be ovoid with red indurated border (Fig 72). If incised they collapse and quickly heal. The important factor in the treat

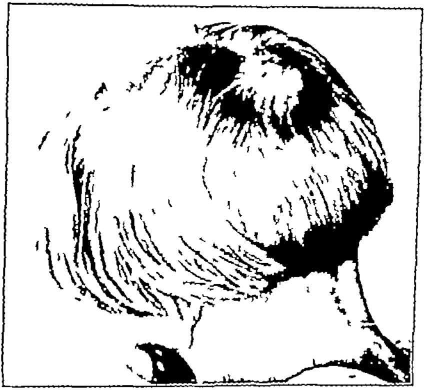


Fig 71.—A spontaneous abscess of the scalp

ment is to discover the cause of malnutrition and to remove it. Many of these are tuberculous in character or at least they occur in patients with tuberculous lesions elsewhere. Others show the definite lesion of tuberculosis of the cranial vault and when they rupture spontaneously the resulting ulcer is that of tuberculosis, with the characteristic soft undermined edges. Gummatous lesions after they have softened may resemble simple abscesses. The ovoid shape and the raised border on palpation because of the periostitis, help in the diagnosis. Usually there

are other evidences of syphilis. Nearly all of these patients do well on the syrup of iodide of iron

Other lesions may suppurate and form a secondary abscess. Wens not infrequently suppurate and unless opened rupture spontaneously Aside from the escape of the foul smelling con



Fig. 72.—Spontaneous subdermal abscess of the forehead.

tents, the patient is inconvenienced but little. There is always the history of a preexisting tumor Wens are not seen in children.

Unusual Wounds of the Scalp

Occasionally unusual wounds of the scalp are encountered The entire scalp may be torn off as when the hair becomes entangled in machinery Sometimes a considerable area is torn off by a charge of shot. The falling of an object from a consid

erable height may tear off a portion of the scalp Contact with electric wires may burn an area of skin (Fig. 73) Large areas may be destroyed in this way Electric burns heal slowly and skin grafting heals badly Cancer quacks by means of paste may produce ulcers of peculiar appearance These can be grafted without difficulty because the surrounding skin is not devitalized



Fig 3 —Electric burn of the scalp.

Tumors

Almost any variety of tumor may be found on the scalp In addition to those occurring as primary tumors many others may be found here as metastases It is necessary here to discuss only a few of the most common

Wens (Epidermoids)

Wens, usually regarded as being formed by the occlusion of the ducts of sebaceous glands but which are really epidermoid tumors, have the scalp as their normal habitat though they may be observed in many regions of the body. They are seen most commonly in women. They appear as rounded tumors project



Fig. 74—Wens on top of the head.

ing from the scalp (Fig 74). They are particularly striking when they occur on a bald head. They vary in size from that of a pea to that of a small orange. Ordinarily they are the size of a hickory nut. When small they may be hard but after they attain some size they are either fluctuating or semifluctuating. Being derived from the skin elements, they are attached to the skin and it cannot be moved over their surface. They may be

movable over the underlying tissue but at points where the scalp is not freely movable, this mobility may not be apparent.

Diagnosis.—It is usually easy to diagnose a wen at a glance but it must be differentiated particularly from dermoids and lipomas. Abscesses, such as tuberculous and breaking down gummas are sometimes confused with them as already noted. Spontaneous abscesses of children are easily differentiated because wens are not seen in childhood Solid tumors are sometimes mistaken for small wens. The chief characteristic being that wens go out from skin structures hence are attached to the skin makes it easy to distinguish them from lipomas and dermoids which are not attached to the skin. Their long duration is a determining factor, but patients sometimes do not discover them until they become inflamed Wens rarely undergo malignant change When this takes place there is a hard indurated area about the base.

Treatment.—The treatment is excision This is easily accomplished by surrounding them with anesthetic fluid and then exposing them through a linear or elliptical incision Being attached to the skin, surrounding this point of attachment by an elliptical incision makes it easier to enucleate the cyst without opening into it Free infiltration with anesthetic fluid between the skin and cyst will also aid in removal Bleeding points should be secured before the skin is sutured lest a blood clot fill the space previously occupied by the wen. Wens sometimes suppurate. When this occurs it is usually recommended that they be allowed to heal before removal of the wen sac is undertaken I have never hesitated, however to remove them at any stage of the process. The inflammation is due more to a degeneration of the sebaceous contents than to any virulent infection If liberally treated with iodine healing is secured with little or no infection and the patient at once gets rid of the offensive discharge When wens undergo malignant change, they must be removed by wide excision.

Dermoids

Dermoids are independent of the overlying skin and occur only at certain situations namely the temple the base of the nose, over the great fontanelle and about the mastoid bone They are smooth, semifluctuating, and not tender

Diagnosis.—Dermoids must be differentiated from wens and lipomas and when they occur at the fontanelles they must be differentiated from meningoceles. The latter are compressible while dermoids are not. Often meningoceles are translucent while dermoids are not. Not infrequently meningoceles are diagnosed over the great fontanelle. Meningoceles do not occur in this region.

Treatment.—Dermoids are easily removed except in those instances in which they send a prolongation into the interior of the cranial cavity. In order to contribute to the tranquillity of the beginner it may be said that an intracranial prolongation is a rare occurrence. In such cases bone-cutting instruments are necessary for their complete removal. Ordinarily simple infiltration with local anesthesia makes an enucleation easy.

Lipomas

Lipomas are most commonly seen about the occiput near the nape of the neck (Fig. 75) and on the forehead (Fig. 76) though they may occur anywhere on the scalp. They appear as ovoid tumors but in some instances they protrude as a sphere. They are elastic, sometimes semifluctuating and the skin is usually movable over them.

Diagnosis.—When the skin is freely movable over them they may be readily distinguished from wens but this mobility is not always apparent. They do not fluctuate as do dermoids and the location is different, being located elsewhere than over embryonal fusion lines.

Treatment.—Infiltration of the skin and about the tumor with novocaine solution makes their removal easy. Prolongation of the tumor into the surrounding connective tissue sometimes causes some annoyance.

Papillomas

Warts, epithelial and fibrous, are frequently seen on the skull (Fig. 77). They not rarely become malignant. When they do the base becomes infiltrated and hard, scabs form which when removed cause bleeding. The chief disturbance they cause is interference with the use of the comb. They must be differentiated from the melanotic warts. The pigmented warts are



Fig. 75.—Lipoma of the nape of the neck.



Fig. 76.— the temple.

easily recognized but some of them having the clinical characters of a melanotic wart have little or no pigment Papillomas are easily excised The whole thickness of the skin should be included in the incision They may be destroyed conveniently with a small electric cautery

Melanomas

Melanomas of the scalp and temple should always be regarded as potentially malignant Those situated on the temple at the hair line are particularly apt to undergo malignant change (Fig 78) Often a blow starts them on their nefarious course

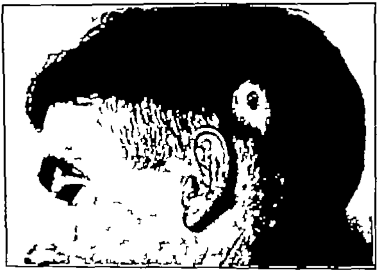


Fig. 77 —Papilloma of the scalp

There may be but little local change Usually however the patient is conscious of some local discomfort which he ascribes to an injury whether he can cite the specific act of violence or not Usually there is some augmentation in volume and there may be some capillary dilatation about the base Not infrequently however the metastatic nodule in the neck is the first thing to be noted and the patient may even be oblivious of the existence of any lesion of the scalp In obscure neck tumors therefore, it is well to inspect the scalp for possible melanomas.

Diagnosis—The recognition of a melanotic tumor is made obvious by the brown or black color Sometimes tumors of this character are found which show very little pigment and yet

harbor the melanoblastic cells These must be distinguished from epithelial warts The latter usually have a rougher, because thicker, epithelial surface are usually taller than wide, and commonly have a constricted base The fibrous warts are usually soft and pedunculated

Treatment.—Melanomas should be removed together with an area of half an inch of normal skin about their base Before removing them the regional lymphatics should be investigated in order to determine whether or not metastasis has already taken place If this is not done and metastatic nodules are pres-



Fig. 74.—Melanoma of the temple.

ent the operator is likely to be accused of spreading the growth Such precautions are particularly necessary if there has been recent injury or irritation of the melanoma Once metastasis has taken place the condition is hopeless although I have one patient free ten years after metastatic glands were removed by a very radical dissection

Epitheliomas

Epitheliomas of the scalp usually occur as slowly growing superficial lesions that require many years for their development. They tend little to the formation of metastasis. They

usually begin as a keratotic lesion but may begin as an epithelial wart or as a wen They grow slowly and *tend but little to* metastasize

Diagnosis—There is no slowly growing ulcerous lesion which may be compared to epitheliomas. The firm borders and the epithelial nests recognizable with the naked eye sufficiently characterize them.

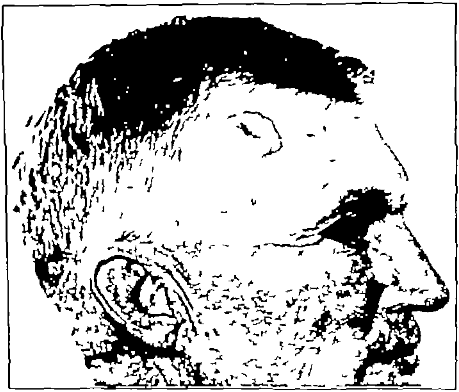


Fig. 78—Endothelioma of the temple.

Treatment—They may be removed by operation but they usually respond to x ray treatment Even large areas two or three inches in diameter may be made to epithelialize under skilled application of radiation When they are removed by operation skin grafting is necessary

Endotheliomas

Sometimes tumors closely allied to epitheliomas are observed on the scalp They grow very slowly requiring many years for their development. The border is elevated and presents a

rounded edge (Fig 79) The center of the tumor is ulcerated and tends to bleed. On section the cells tend to the formation of a network of columns which suggest their classification with the endotheliomas

Diagnosis—Their slow growth associates them with epitheliomas They have more raised borders and cell nests cannot be distinguished



Fig. 80.—Sarcoma of the scalp.

Treatment.—They do not do well under radiation and should be removed by excision and the defect should be covered by a skin flap They do not return when so removed

Sarcomas

Sarcomas of the scalp are rare tumors which usually occur as ovoid tumors attached to the skin and move freely over the scalp They are firm elastic and not infrequently bossilated (Fig 80) Sometimes the skin covering them is red and shows a plexus of vessels

Diagnosis—Their elasticity and the presence of fine vessels over their surface is usually diagnostic They are not uncommonly cut into on the belief that they are wens

Treatment.—These tumors if completely excised may remain cured but when cut into under the mistaken diagnosis of wens prompt recurrence is the rule Once recurrence has taken place cure is out of the question

Angiomas

The root of the nose the temple region (Fig 81) the occiput less often the base of the mastoid and the great fontanelle (Fig 82) are common sites for angiomas The racemose or cavernous type may cover large areas of the scalp without definite outlines (Fig 83) Sometimes angiomas are associated with papillomatous growths (Fig 84)



Fig. 81.—Angioma of the scalp.

Diagnosis.—Their compressibility color and the presence of visible vessels about their borders usually give a sufficient diagnosis

Treatment.—When small they may be destroyed by cautery or by ligation and excision. The larger ones, particularly when they approach exposed surfaces, may be excised without destroying the surface skin They are anesthetized with novo-



Fig. 82.—Angioma on the great fontanelle.



Fig. 83.—Cavernous angioma of the temporal region.

came and an incision is made about half their border cautiously exposing the vessels before they are cut (Fig. 85). The vessels as they are exposed are double clamped and cut. The whole

tumor mass together with the covering skin is then lifted off the skull until the vessels on the opposite border of the tumor are reached These are then clamped and cut The tumor is cut from the skin and the vessels previously clamped are ligated. The skin is replaced and the defect is completely closed The



Fig. 84.—Papilloma associated with angioma.

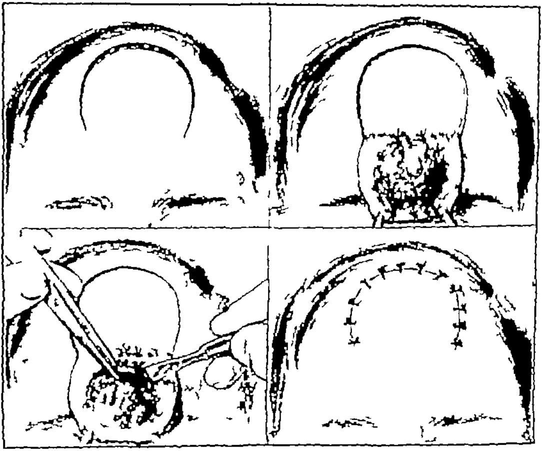
diffuse cavernous types cannot be so managed but they may be gradually obliterated by packing gauze between the skull and the tumor or the vessels about the periphery may be ligated.

Tuberculosis

Tuberculosis of the scalp is sometimes seen in feeble children the subjects of tuberculosis elsewhere It appears as abscesses under the skin without bone involvement Often there is no

better reason for believing that these lesions are tuberculous than the mere fact that there are tuberculous lesions elsewhere These lesions are confined to children. In the adult tuberculous ulcers of the skin itself appear as punched-out ulcers with soft overhanging borders and dirty base Most tuberculous lesions

A B



C D

Fig. 85.—Technic for the subcutaneous removal of large hemangiomas. *A* the skin is incised but the vessels are not cut *B* the vessels are doubly ligated and the skin together with the tumor is elevated, exposing the skull *C* the vessels at the lower border of the tumor are doubly ligated and the tumor is being dissected from the skin *D* the skin flap is replaced and sutured.

of the scalp begin as a periostitis with the formation of an abscess (Fig 86) and the final destruction of the skin producing an ulcer of the form just noted

Diagnosis—Before ulceration they may be mistaken for a wen a pyogenic abscess or a gumma Usually the more flattened outline the generally impaired physical state of the patient

differentiate it from a wen From a pyogenic abscess it is distinguished by its slower development It develops less slowly than a gumma and other signs of syphilis are absent



Fig 86—Tuberculous abscess secondary to tuberculosis of the skull.

Treatment —Opening of the abscess and curetting the interior with packing of iodized gauze furnishes the first treatment If the patient s general condition is good healing is usually prompt

Syphilis

Syphilitic involvement of the scalp appears as gummatous lesions. They come as elevated nodular lesions spontaneously painful and tender to touch (Fig 87) Within four to eight weeks the top ulcerates and the usual reniform punched-out

syphilitic ulcer results. The lesions are usually multiple When seen early, they may be mistaken for contusions in fact, a contusion may serve as the point of development for a gumma. The gummas frequently involve the cranium and cause extensive bone necrosis.

Diagnosis—The ulcer must be differentiated from a tumor particularly sarcoma, and tuberculosis. They develop more rapidly than either are usually multiple and the outline is reniform A therapeutic test will clear up any doubt Sometimes



Fig. 47—Gumma of the cranium. Note elevated nodule to the left of the median line.

gummas make prominent tumors which bring up the question of sarcomas. Sarcomas of the cranium may appear much like gummas They are less rapid in growth and are less painful. Sarcomas extend as deeply into the cranial cavity as they extend above it. This is readily determined by the x ray and is pathognomonic.

Treatment.—The usual antisyphilitic treatment generally quickly clears up all lesions, leaving only the pale scar to indicate the site. When the bone is involved it must be removed by the curette or the rongeur Very extensive bone involvement is sometimes encountered.

DISEASES AND INJURIES OF THE SKULL

Affections of the cranial bones hardly fall within the province of minor surgery However there are frequently situations in which the "minor surgeon" finds himself in which some knowl edge of cranial diseases and injuries of this region is imperative

Diseases of the Cranial Bones

Excluding malignant diseases, primary and secondary one has only to consider the pyogenic diseases and the granulomas.

Tumors of the Cranial Bones

Tumors of the cranium are confined to sarcomas and osteomas, leaving out of account the various metastatic lesions. Sarcomas are formidable diseases seldom amenable to any treatment

Osteomas—Osteomas may appear as cancellated tumors with a dense shell covering (Fig 88) or as is more common a dense ebur nated semiglobular exostosis. Both types are innocent

Diagnosis—Their density is usually apparent on palpation Those containing cancellated tissue usually have a constricted base

Treatment.—The chisel usually makes short shift with this tu mor though the eburnated variety may be so dense as to require considerable labor to accomplish their removal.

Infections of the Cranial Bones

The most common infection is an extension from mastoid dis-eases. Whenever there is a spreading abscess following a mas toid infection, the possible presence of diseased bone must al ways be considered. Injuries to the skull which become infected particularly if there is a fracture are apt to be followed by necrosed bone

Diagnosis.—When such abscesses are opened, the bone must always be explored for possible bone involvement Not uncom monly particularly in children, when such an abscess is opened a plate of bone will be found already loose and can readily be removed In adults it is only after such an abscess has existed for a considerable time that the bone will have been already loosened. Usually the bone will be noted to be dead but still *in situ*

Treatment—When the bone is already loosened it is an easy matter to remove it When the bone is poorly loosened it may be removed as much as possible with the ronguer so far as the

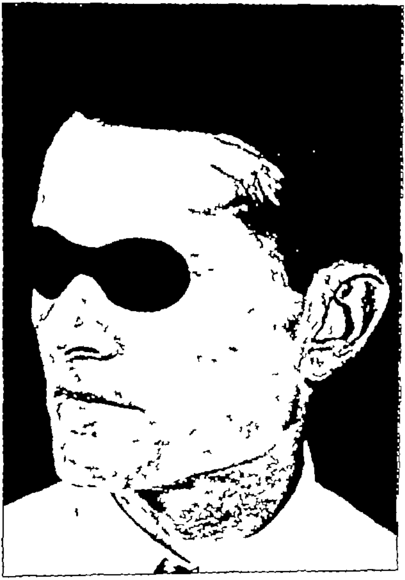


Fig 33—Exostosis of the skull

dura is walled off by granulation tissue Care should be taken not to loosen it beyond this point lest a spreading septic meningitis be produced

Granulomas of the Skull

Syphilis and tuberculosis are the only common types of granulomas of the skull which are encountered

Syphilis

Usually the bone becomes affected secondarily to gumma of the soft parts. The bone becomes honeycombed and fragile It may be coextensive with the scalp involvement or wide areas may become involved with a comparatively healthy skin covering Usually the diseased bone is extruded but sometimes the process may be hastened by the mechanical removal of the diseased bone

Tuberculosis

In tuberculosis the skull may be affected over wide areas when the superficial lesion is small Often the bone is separated from the dura for a considerable distance A tuberculous bone is less apt than a syphilitic one to be cured spontaneously The mechanical removal is a formidable process. Usually the disease involves other regions of the body so extensively that radical operation is not justified

Injuries of the Skull

There is no injury where it is more difficult to differentiate the inconsequential and the grave than in injuries to the head Loss of *consciousness is the most impressive phenomena* but it may exist without grave injury and grave injury may exist without being attended by loss of consciousness. The common interest among the laity and in a considerable proportion of the profession is centered about the question of the presence or absence of fracture In case of head injury the head is at once rayed, and if a fracture is not found an undue optimism is apt to be entertained. As Stewart has so well emphasized the very presence of a fracture by aiding the escape of blood and serum may be an aid Aside from actual traumatic laceration of the brain tissue the problem centers about intracranial pressure. Intracranial pressure therefore is the one thing which must be kept in mind. Most general practitioners understand the technic of determining intraspinal pressure and many can detect a developing choked disc with the ophthalmoscope

Concussions

In concussion of the brain there is molecular disturbance without organic injury Following a blow upon the head the patient

loses consciousness but after a time this is regained without permanent bad results In this condition the symptoms characteristic of skull fracture are absent—hemorrhage from the ear, suggulation in the orbit etc In ordinary parlance, the patient has been knocked unconscious This is a common sight in the athletic fields of our universities and may even be observed in the prize ring If consciousness is not regained within a few minutes, a graver view must be taken of the matter The question of fracture must be considered and the machinery capable of detecting the approach of excessive intracranial pressure must be set into motion

Fracture of the Skull

Skull fractures may be divided into local fractures and fractures at the base

Local fractures are those occurring at the point where the blow is struck. It is commonly depressed but may represent a fissure or a fracture of the inner table

Depressed Fractures

A local blunt injury may cause a fracture at the point of impact The whole thickness of the skull may be depressed but the inner table may be depressed more than the outer Such injuries may present only the symptoms of concussion and the diagnosis must be made from the local findings. Sometimes the injury is so great that palpation shows depression and loose fragments. Sometimes there is but an elevation of the scalp as in contusion of the scalp and the state of the bone beneath cannot be determined by palpation. Or there may be an area of swelling about a contusion that may simulate a depression in the bone When no other means are at hand the surface of the skull may be palpated by the end of a needle Most conveniently a hypodermic needle may be used The skin is anesthetized and the needle is then passed along over the surface of the skull If there is a depression in the bone the needle readily detects it. A linear fracture usually is readily detected, sometimes even when the x ray fails to disclose its presence If the inner table alone is injured it will not be detected by this means If x ray are available this means will naturally be used and will show a de-

pression if a fracture exists. The x ray should not be relied upon to the exclusion of the consideration of the clinical signs

Fracture at the Base

In this injury somewhere about the base of the skull there is a fracture of the bones This usually involves the sphenoid or petrous portion of the temporal bones The fracture is due to a transmitted bursting force Usually this fracture is detected by the x ray but the clinical signs must also be considered.

The chief symptoms are escape of fluid and blood from the ear and the appearance of blood in the conjunctiva. The appearance of subcutaneous hemorrhage in the orbit is significant when it appears twelve to twenty four hours or more following the injury Occurring soon after the injury it may be difficult to exclude direct trauma to the orbit the common black eye '

Treatment.—If the ear or nasal fossa is involved in the fracture these cavities should be kept free from infection. Aside from this there is little to do

Cranial Injuries Leading to Unconsciousness

The chief pitfall in the early management of cranial injuries lies in the fact that the injury may be more serious than it first seemed. After a brief period of unconsciousness, the patient may apparently recover and be allowed to go on his way After a number of hours unconsciousness may return, due to increased intracranial pressure the result of late bleeding No cranial injury should be allowed to pass from observation before the lapse of twenty four hours

Again cranial injuries may be masked by intoxication or complicated by it Here also the responsibility of a differential diagnosis is a considerable one disagreeable though it be

CHAPTER VI

DISEASES OF THE NOSE, NASOPHARYNX AND TONSILS

AFFECTIONS OF THE NOSE

The function of the nose is to admit air to the deeper respiratory tract It is not a part of its function to annoy its possessor by emitting a secretion. If it either does not do the first and does do the second it subjects itself to professional scrutiny

Obstruction of the Nasal Passages

If there is obstruction, enlarged turbinates, deviation or exostoses of the septum or polypi are the likely disturbances. In children the ubiquitous adenoids most likely are present. The causes of secretion are coryza or affection of the sinuses or some new growth In children foreign bodies and syphilis must be considered In coryza the turbinates are swollen obstructing the breathing, there is a sense of fullness and burning and there is a profuse discharge As the disease progresses the discharge becomes more abundant and thicker and the burning ceases The cause of chronic discharges must be determined and the cause removed Deviations of the septum and hypertrophied turbinates and polypi are the common causes of obstruction but not of discharge Infections of the sinuses discharging their contents into the nose are the common causes. These may be recognized by the point of discharge and tenderness over the sinus affected and, in some instances by the x ray The antra discharge their contents beneath the middle turbinate body while the frontal and ethmoid discharge above the middle turbinate Severe pain in the frontal region is the common symptom of frontal and ethmoid infection. The antra may be tender to pressure but often puncture with washing out may be required for a diagnosis.

Diagnosis—While acute coryza usually is self evident, yet a specific affection such as hay fever must be kept in mind and

in infants syphilis must always be considered Enlarged turbinates, deviations of the septum and the like, are recognized by anterior rhinoscopy Enlargement of the posterior end of the turbinates can be recognized by means of the pharyngeal mirror It is always advisable to shrink the turbinates by means of a cocaine adrenalin solution so that a clearer view may be obtained.

Treatment—Chronic obstructions to the passage of air must be remedied by a suitable operation The obstruction caused by enlargement of the inferior turbinate can be relieved by painting a line along their surface with trichloracetic acid After the turbinates have been shrunken and anesthetized by means of a pledget of cotton soaked in a 2 per cent cocaine solution a probe armed with a small bit of cotton is dipped in the acid and then drawn along the turbinates from one end to the other Several applications made a week or two apart may be required before they remain permanently shrunken. This is less destructive than the old method of cutting a line with an electrocautery Infections of the sinuses when acute should be treated by placing a hot towel over the face and nose allowing the hot steam to be inhaled. This often relieves the pain and causes the opening of the sinuses to become patulous permitting the penned up contents to escape When this does not avail, openings must be made by means of operations These operations which make a permanent adequate opening are to be preferred because the mucosa once affected has but little tendency to return to normal

Foreign Bodies in the Nose

Not infrequently particularly in children some object is passed into the nose and becomes lodged there Small stones beans and peanuts are the common objects. Older children usually confess to having passed the foreign body into the nose In young children such an occurrence must be suspected whenever there is a persistent discharge from one nostril The objects usually placed in the nose being round and smooth are hard to grasp with forceps. If they cannot be grasped they may be removed by making a spoon hook out of the flat end of a silver probe By passing this over the offending body it can be extracted Pushing the body back into the pharynx is usually expeditious and effective

Care must be taken that the body when it reaches the pharynx is not aspirated into the larynx.

Bleeding of the Nose

Occasional bleeding of the nose, particularly in children, may be of little significance and without discoverable cause This sometimes occurs with or in lieu of the menstrual flow in young women and is then called vicarious menstruation When excessive bleeding occurs in children or when it occurs in adults the

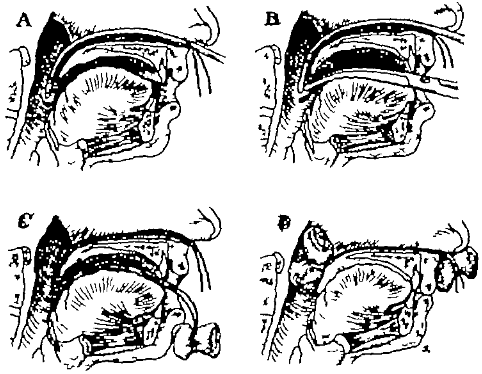


Fig 89—Postnasal pack for hemorrhage. *A.* A catheter armed with a silk string is passed along the floor of the nose. *B* The string is grasped with a forceps and is drawn out of the mouth. *C* A gauze pledget is fastened into the loop. *D* This pledget is passed behind the soft palate and is held in place by tying the ends of the string over a pledget at the anterior nares.

cause must be sought The common cause is a superficial ulceration of the septum near the nares. These appear as superficial ulcers with a bright red granular base These ulcers sometimes destroy the cartilage leaving a hole in the septum

Diagnosis—Other possible cause for hemorrhage must be thought of such as chlorosis and pernicious anemia. Ulcer of the nose may be syphilitic but these do not bleed In people of advanced years a malignancy must be thought of

Treatment.—Ulcers are best managed by cauterizing them with trichloracetic acid after thorough cocainization. The spot may be kept from reforming by using yellow oxide of mercury to the anterior end of the septum as far back as can be reached by the tip of the little finger. The ulcer can be definitely cured only by resecting the underlying cartilage. Any sinus trouble, which usually underlies the development of the ulcer should be relieved if possible. For the immediate stoppage of the hemorrhage many popular remedies have been recommended such as folding a paper and putting it under the upper lip dropping cold water down the back of the neck unobserved by the

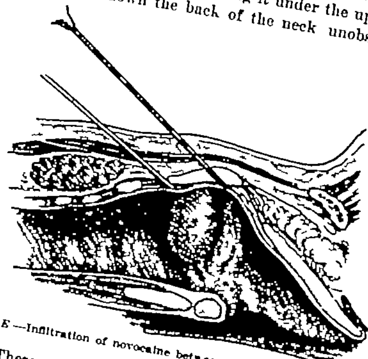


Fig. 89-E.—Infiltration of novocaine between the mucosa and ligaments.

patient. These measures merely play for time for the spontaneous cessation of the hemorrhage. When there is hemorrhage of importance the bleeding point should be sought. If discovered direct pressure may be made with a string of gauze or a pledget of cotton. When this does not avail and the patient becomes pale and faint more definite means must be sought. The best is the packing of the posterior nares with a cotton or gauze pack. A string is passed through the nares and out the mouth. This can be accomplished by tying the string near the end of a rubber catheter (Fig 89 4) and passing both through the nares. It is then grasped through the mouth when it appears behind the soft

palate (Fig 89 *B*) *A pledget of gauze is tied to the string* (Fig 89 *C*) and the pledget then passed behind the soft palate and then pulled into the posterior nares. The string is then tied over another pledget under the tip of the nose (Fig 89 *D*) It is well to begin the procedure with a quarter of a grain of morphine given hypodermically in adults. Usually the hemorrhage will cease from this while the surgeon is preparing his pledget. In children a general anesthetic is usually required because the manipulation of passing the catheter soon destroys the confidence of the child.

Nasal Polyps

Nasal polyps are myxoid tumors which grow down from the upper or middle turbinate bodies and fill the nares. They are pear-shaped, with the small end at the point of attachment They are usually dependent upon the diseases of the sinuses. They are easily recognized by rhinoscopy as shining bluish tumors which more or less completely fill the nares.

Diagnosis—The nasal polyp protruding behind the soft palate must not be mistaken for fibromas of the pharynx. These are much more formidable being harder and attached by a broad base. Sarcomas beginning in the nasal passages likewise may resemble polyps, but they are always more extensive of deeper pink color and are firmer

Treatment.—Polyps should be removed with a wire snare and the point of their attachment cauterized with trichloracetic acid and their cause removed if it can be discovered. Often after apparently all have been removed others will be found after the lapse of a few days Their appearance is due to the fact that after the larger ones located low down are removed those situated higher up can come down and occupy the space recently vacated Polyps sometimes protrude behind the soft palate and must be removed through the mouth

DISEASES OF THE PHARYNX

Adenoids dominate this field but it must be remembered that other diseases may occur here

Adenoids

Enlargement of the adenoid glands producing obstruction of the posterior nares is perhaps the most common disease of childhood. By interfering with proper nasal respiration, the nutrition and general development of the child is interfered with and the arch of the palate is deformed producing an abnormally high arching The expression of the face is dull the eyes listless and the mouth is held open. There is often a complicating otitis

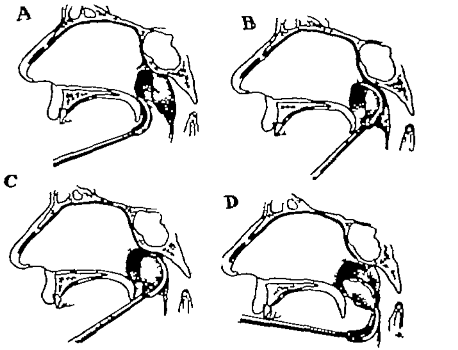


Fig. 30—Adenoidectomy *A*. With the handle of the adenotome depressed, the instrument passes along the posterior edge of the vomer to the highest point. *B* With the handle depressed, the instrument is pressed backward, engaging the adenoid. *C* The adenoid is cut from the base of the occipital bone by a direct thrust backward. *D* The mass is then cut from the posterior pharyngeal wall by lowering the cutting edge of the instrument at the same time the handle is elevated.

media with impaired hearing Impairment of hearing may be the result of pressure of the tubal ostium without ear involvement.

Diagnosis.—The typical adenoid face is pathognomonic but this is seldom seen because such extensive degrees are prevented by the watchful eye of the practitioner aided in many cases by the school nurse If there is mouth breathing with or without involvement of hearing the presence of adenoids is probable In children the diagnosis is best established by palpation. Not

all tumors of the pharynx, however, are adenoids Sarcomas are by no means rare in children. These produce large bulging tumors which bleed readily on touch In adults the pharynx may be inspected with the mirror Fibromas occur in the pharynx in young males These usually do not appear until after the adenoid age

Treatment—Removal of the adenoids is the only consideration This operation may be done without an anesthetic, but when an anesthetist is available ether should be used. Proper *apparatus for aspirating the blood should be at hand when a* general anesthetic is given, lest blood be aspirated into the lungs, giving rise to lung abscesses With the mouth held open with a gag the tongue is depressed and the adenotome hooked under the soft palate (Fig *90 A*) and slid along the posterior edge of the vomer while the handle is being depressed. When the adenotome has reached the highest point (Fig *90-B*) the blade is forced along the base of the occipital bone (Fig *90 C*) and swept down the posterior wall of the pharynx the handle of the instrument being raised while this is being done (Fig *90-D*) Several cuts usually are necessary in order to clear the entire pharyngeal vault. *The usual fault in doing this operation is that the blade of the* instrument does not reach the anterior border of the growth Strings of mucous membrane may remain on the lower border of the adenoids. These should be trimmed off with scissors lest they cause irritation and cough The hemorrhage quickly ceases either with or without compression

DISEASES OF THE TONSILS

Aside from the medical diseases of the tonsils, notably, tonsillitis and diphtheria there are a number of diseases which lie within the province of the surgeon These are peritonsillar abscess hypertrophied tonsils, Vincent's angina lymphosarcoma leucoplakia and carcinoma

Peritonsillar Abscess

As a sequel usually of acute tonsillitis an abscess forms behind the capsule This is characterized by an intense reddening of the anterior pillar and the dislocation of the tonsil medially Usually the jaws are more or less fixed.

Diagnosis.—The acute onset and the intense redness of the anterior pillar the bulging of the retrotonsillar space and constitutional reaction and set jaws distinguish it from rapidly growing lymphosarcoma

Treatment.—The treatment is drainage of the abscess. This should be done as soon as possible It is not necessary to wait until pus is demonstrated as fluctuation An incision is made through the anterior pillar and the wound (Fig 91) is then widened by introducing a forcep and spreading the blades This

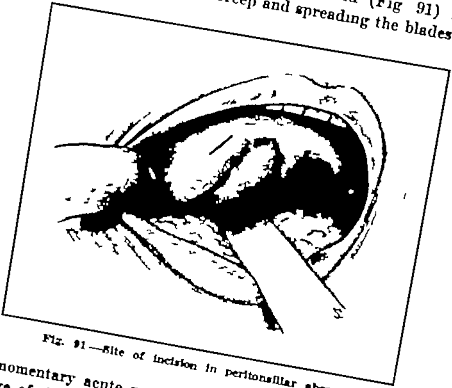


Fig. 91—Site of incision in peritonsillar abscess.

gives momentary acute pain but the relief experienced by the drainage of the abscess is so great that the patient forgets the agony of the moment of opening the abscess. The pillars can be anesthetized if the abscess is early but when the abscess has existed some days the wall is so thin that the attempt to inject the local anesthetic is unsatisfactory It is best then just to paint the surface a number of times with cocaine solution or proceed at once with the introduction of the knife Under no condition should the patient be given a general anesthetic lest in the struggle caused by the anesthetic the abscess rupture spontaneously and the patient drown in his own pus

Postpharyngeal Abscess

In association with other inflammations of the throat or independent of them an abscess may form between the postpharyngeal mucous membrane and the vertebral bodies They are attended by constitutional reaction such as attend peritonsillar abscesses and in addition deglutition and respiration may be much interfered with.

Diagnosis—*A bulging from the posterior wall, fluctuating in character is easily discovered on examination*

Treatment.—The abscess should be incised without anesthesia lest pus be aspirated during the administration of the anesthetic

Hypertrophied Tonsils

It is rarely now that the tonsils reach the large size formerly observed because of the vigilance of the young laryngologic specialist and the school nurse. This vigilance has no doubt led to tonsillectomies being done with too great an abandon. One should attempt to formulate an excuse for removing them in each instance The following conditions may be suggested as warranting the conclusion that the tonsils are diseased *recurring tonsillitis particularly if the tonsils are imbedded or* attended by peritonsillar abscesses *a* previous attack of rheumatism or chorea chronic or repeated attacks of cervical adenitis, the odor imparted to the breath, particularly in imbedded tonsils and those with follicles containing débris, tonsils so large that respiration is interfered with and finally in badly nourished children in the absence of demonstrable cause for the mal*nutrition.*

Diagnosis—The history is of more importance than the examination of the tonsils in establishing the diagnosis of tonsillitis or infected tonsils Inspection will show whether or not the tonsils are imbedded or whether they are large enough to impede respiration The presence of follicles filled with débris does not indicate necessarily that the tonsil is responsible for any ill *health that may involve the patient.*

Treatment.—The removal of tonsils is too commonly regarded as a trifling procedure It should not be undertaken unless the operator is possessed of proper equipment If a general anes-

thetic is to be used some sort of aspirating apparatus should be at hand so that blood may be prevented from being aspirated into the trachea, endangering the patient to lung abscess and septic pneumonia. Complete anesthesia is necessary Means for the control of hemorrhage likewise should be at hand. In adults

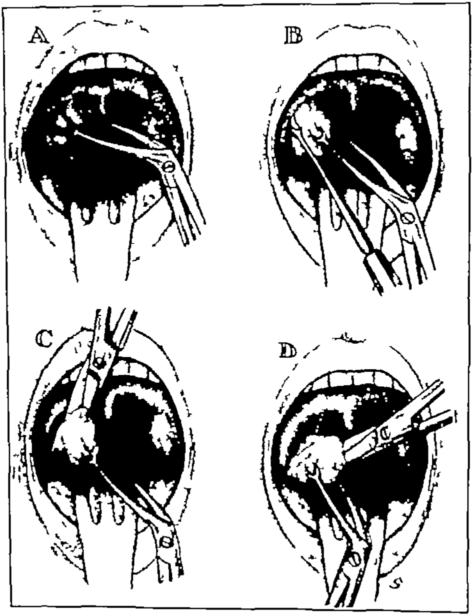


Fig 9.—The operative removal of the tonsils. *A*. The tonsil is grasped by suitable forceps and pulled toward the midline. *B* The anterior pilla of the fauces is separated from the tonsil by means of a curved knife. *C* The upper pole is separated with a curved scissors. *D* The tonsil is then separated from its bed.

local anesthesia is simple and saves the patient the inconveni ences incident to general anesthesia

The technics of removal are many As good as any is as follows after anesthetizing the tonsil by injecting a novocaine solution at various points (Fig 92 A) the tonsil is grasped with forceps and drawn medially, the anterior pillar is then separated from the tonsil by means of a tonsil knife (Fig 92 B) The remainder of the tonsil may then be enucleated with a curved scissors (Fig 92-C) and when the whole is separated to a narrow pedicle (Fig

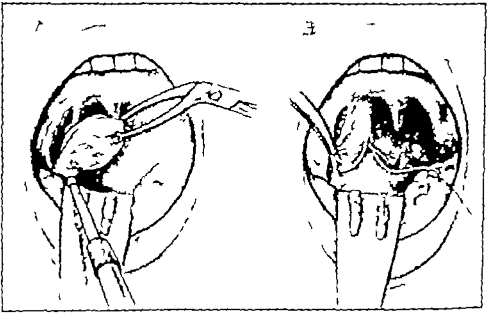


Fig 93.—Tonsillectomy A After the tonsil has been separated to its base, the pedicle is cut off with a snare. B In case of hemorrhage the pillars are drawn together by means of a catgut suture.

92 D) this may be separated with a snare (Fig 93 A) Should a *notable bleeding occur after tonsillectomy which compression for a* few minutes with cotton pledgets does not stop it is best to secure the bleeding point with a suture (Fig 93-B) or control it by liga tion If these are not at hand a styptic such as alum or tannic acid or the combination of the two may be used Some of the in struments designed to exert pressure over the bleeding area may be used if the operator is inexperienced in the application of su tures or ligatures in deep cavities.

Sarcoma of the Tonsil

The chief symptom of sarcoma of the tonsil is the rapid and progressive increase in size They are usually as large as a walnut or larger when first seen, so that there is no doubt as to diagnosis. Operations fail to cure and x ray gives temporary relief hence x ray is the preferred treatment

Vincent s Angina

Vincent s angina is an inflammatory affection of the throat caused by an infection by Vincent s spirillum. It is characterized by high fever and intense inflammation of the tonsils, pillars and often the alveolar borders of the jaws Usually there is an intense cervical lymphadenitis As a result of this extensive inflammatory reaction the mouth can be but imperfectly opened. The breath is often exceedingly offensive

Diagnosis —The demonstration of the spirilla gives the diagnosis When the region of the tonsil alone is affected peritonsillar abscess may be thought of but the bulging of the tonsil is lacking Even if a spirillum is demonstrated, a careful examination of the blood must be made because sometimes a leucemia or a pernicious anemia may be present and the anginal infection is the secondary and less important affection. The possibility of a syphilitic infection likewise must be taken into account.

Treatment.—Frequent swabbing of the affected area with iodine or salvarsan solution usually brings a cure but occasionally patients are so overwhelmed by the poison that they die

Leucoplakia

The pillars of the fauces are often the seat of leucoplakia The disease is characterized by the pearly white elevated surface It may exist for many years without change but not infrequently the borders of the patches become indurated and malignancy ensues. The advent of malignancy is indicated when the border becomes indurated or bleeds when roughly manipulated

Diagnosis —Mucous patches must be considered The pain and glandular involvement and the acute onset should distinguish this disease from the chronic symptomless leucoplakia. The discovery of the spirochete of course is pathognomonic of

syphilis There is no evidence that all leucoplakia lesions are signs of chronic syphilis

Treatment.—*Destruction* with the cautery under *local* anesthesia secures a cure in most cases Unless there is evidence of approaching malignancy their presence may be disregarded. Radium has been used sometimes with success

Obstructions of the Trachea

Obstructions to the passage of air through the trachea are many In children *tracheal diphtheria* is a common cause. Foreign bodies as a cause of tracheal obstruction are usually observed in children but by no means are confined to them

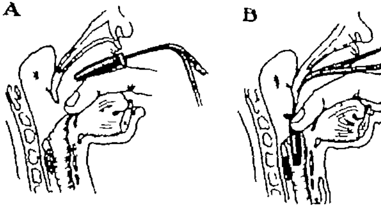


Fig. 94—Intubation. *A* The epiglottis is located by the tip of the left index finger and with this as a guide, the tube is passed over the tongue to the glottis. *B* As the tip of the tube reaches the glottis, the handle is raised in order to bring the tube into the axis of the trachea.

Tumors papillomas in children, and malignancies and syphilis in adults are by no means uncommon

Diagnosis—Inspiratory dyspnea and cyanosis indicate obstruction. History is usually of importance but in some instances the emergency is so urgent that this cannot be obtained.

Treatment—*In inflammatory obstruction palliation by means* of ice packs may be useful Failing in this, intubation is the procedure of choice A tube conforming to the age of the patient is sterilized The patient is held on the lap of the nurse The limbs of the child are controlled by wrapping them in a sheet. The mouth is held open by a suitable gag preferably one of wood or cork The operator locates the epiglottis by means of the index finger of his left hand (Fig 94-*A*) The tube follows

along this as a guide until the lip of the tube lies above the glottis. The handle is then sharply raised as high as possible and the tube is guided down the trachea by the index finger of the left hand (Fig 94-*B*) When it is found to be in place, the

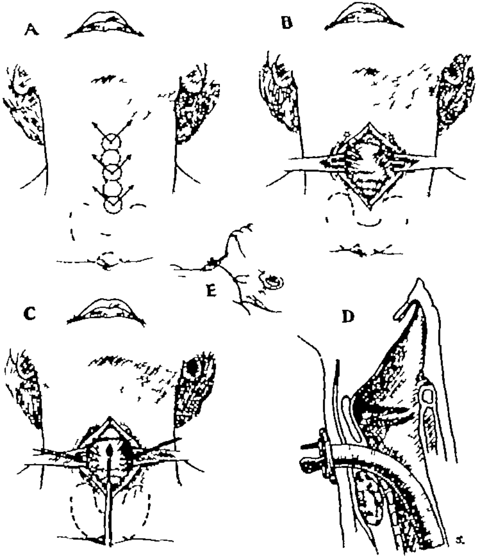


FIG. 95.—Operation for tracheotomy *A*. Line of skin infiltration. The arrows show the direction of infiltration of the subcutaneous tissue. *B* Incision of the soft parts exposing the trachea. *C* Incision of the trachea rings. *D* Cross section of the trachea showing the tube properly placed. *E*. Showing the tube held in place by means of a tape about the neck.

handle is released and the tube allowed to remain in the trachea. Usually a silk thread is attached to the tube to permit of its easy removal. It must be fastened to the cheek by means of ad

hesive strips and the child's hands so restrained that it cannot withdraw the tube For emergency conditions tracheotomy is more suitable, since it is quickly performed and requires less skill. Whenever there is any likelihood of an emergency such a tracheal tube and the required instruments should be at hand Novocaine adrenalin is the anesthetic of choice A line of skin is infiltrated in the midline extending from the thyroid cartilage to over the *third tracheal ring (Fig 95 A) Through this ring the deeper* tissues are infiltrated If time is not a matter of great moment the tracheal mucosa is anesthetized by passing the needle through *the tracheal wall after it has been exposed (Fig 95 B)* so that it comes to lie between the rings and the mucosa (Fig 89 *E*, p 161) If properly infiltrated there is no coughing when the trachea is opened Usually the first and second rings are cut (Fig 95-*C*) It is essential that an opening large enough be made so that the end of the trachea tube lies parallel with the axis of the trachea (Fig 95-*D*) If this is not done the end of the tube will press on the tracheal wall producing ulceration and exuberant granulations which partly obstruct the trachea after the tube is removed If possible the tube should be removed in a few days During this *time no trouble will be experienced If allowed to remain more* than ten days, trouble may be experienced either because the granulation tissue partly obstructs the trachea or because the glottis fails to function. Sometimes in the absence of any obstruction the patient cannot breathe In such cases intubation should be temporarily substituted for the tracheotomy tube

CHAPTER VII

DISEASES OF THE MOUTH AND JAWS

The diseases of the mouth and jaws, like those of the face present many minor and major affections the borderline between which is often difficult to draw Nowhere else in the body are the minor affections so often overlooked hence a detailed consideration is very important

DISEASES OF THE JAW

The jaw is often affected by disturbance in the eruption of the teeth and by diseases of normally situated teeth Embryonal displacements resulting in solid and cystic tumors furnish a minor group of disturbances Secondary bony outgrowths of a benign character are not rare. Periosteal malignant disease of a mild type is common very malignant tumors are rare

Malerupted Teeth

The wisdom teeth are most often the source of trouble When wrongly directed they impinge on their neighbors and inflammation ensues At first the gum becomes inflamed infection develops the masseter muscles take part in the reaction and the jaw is locked The infection may extend down the neck, forming deep abscesses which may extend to the mediastinum unless the pressure is relieved Abscesses may burrow and find a spontaneous opening in the cheek or else form abscesses which require opening This may appear in the cheek (Fig 96) or somewhere down the neck (Fig 97) When they occur down the neck they may appear as direct extension from the tooth or from the breaking down of a lymph gland Sometimes the abscess extends into the muscles of mastication or into the articulation of the lower jaw and causes permanent disturbance in the movements of the

jaw Sometimes the tooth is the cause of intense neuralgia like pains in the jaw The teeth may not be suspected unless an x ray picture shows a tooth in malposition or an abscess about the root of a normally situated one

If the disorder can be followed from the beginning the diag nosis is not difficult but when one does not see the patient until the masseters are set and an abscess has formed in the neck the interpretation may not be so easy In such situations the teeth should be remembered as a possible source of trouble and the history of antecedent sore gums must be sought The x ray usually supplies the determining evidence



Fig. 86 —Abscess from a wisdom tooth.

When seen early a liberal splitting of the gums over the tooth usually cuts short the process The tooth should be removed at the earliest moment Usually it can be extracted without disturbing any of the healthy teeth but occasionally the tooth just in front must be removed before the impacted tooth can be dislodged Once the jaw is set it is impossible to reach the tooth Then cold packs may be used and the formation of an abscess watched for Once it forms it must be drained One cannot wait for fluctuation in such cases. If the process does not subside in a few days but becomes boggy an incision should be made. Should no pus be found the incision will at least deplete the tissues

Sometimes teeth in other situations cause trouble either by causing pain or by suppuration causing disease of the jaw and

perforation through the bone and gums to the surface of the skin (Fig 98) Any pain in or near the alveolar border even if apparently of neuralgic character, should call for an x ray of the teeth. The same applies, of course if there is necrosis of the jaw Once the offending tooth is located it is a simple matter to remove it

Necrosed Teeth

Broken teeth have played an important rôle in the pathology of the mouth Aside from the general disturbance they are capable of producing by irritating the soft parts the gums the



Fig. 99 —Submaxillary abscess from abscessed tooth. Abscess is broken down lymph node.

cheek, and the tongue they have in many instances produced an ulceration which has resulted in a carcinoma Of all the examples of the relation of chronic irritation to the production of cancer this is the most outstanding Broken teeth and badly fitting dental apparatus should be corrected without delay

Necrosis of the Jaw

Violent infection from either of the causes previously noted may separate the periosteum from the bone for long distances causing a

varying extent to necrose Infection about the tooth may invade neighboring teeth so that all the teeth in one or both sides are loosened and are bathed in a pocket of pus In the first named instance the whole thickness of the jaw becomes involved while in the latter the alveolar border becomes a trough of pus as deep as the sockets extended

Necrosis of the jaw is distinguished from single alveolar abscess by the greater extent of the swelling and tenderness and by the much greater constitutional reaction In severe cases a



Fig 91.—Sinus due to infected tooth root.

number of teeth may be loosened by the suppurative process or the periostitis is manifest by thickening and marked tenderness. Thickening from gum hypertrophy or from dentigerous cysts is without pain or constitutional reaction

If necrosis of the entire bone takes place it must be removed Extensive drainage accomplishes the immediate demands. It is best then to wait until the dead bone separates When the interior of the bone only is necrosed it must be gouged out with a curette. Both conditions are serious and a small proportion of patients succumb to generalized infection

Hypertrophy of the Gums

In this peculiar malady the gums particularly of the upper jaw become hypertrophied The cause is not known. The gums become gradually thickened until they reach a certain size (Fig



Fig. 99 —Beginning hypertrophy of the gums in a boy aged 14

100) and then remain stationary When small they do not cause inconvenience (Fig. 99) but when they become large covering much of the hard palate the inconvenience is serious (Fig 100) They are firm elastic like the epulides but their diffuse charac ter distinguishes them from the epulides Dentigerous cysts are

spindle-form and smooth and sometimes the thin shell of bone can be indented

They are best managed by cutting away a portion of the enlarged area under local anesthesia and when this is healed a



Fig. 106.—Hypertrophy of the gums.

new part is attacked In this way the patient is relieved of the malady with less inconvenience than if the entire area were removed at one sitting

Cysts of the Jaw

Simple developmental cysts are occasionally seen. These are formed by a thin sheet of bone enclosing a thin bluish fluid The

enlargement is spindle-form and the bone is often so thin that it gives under pressure like the bottom of an oil can

These conditions must be distinguished from odontoid tumors which expand the bone but instead of being filled by fluid they are filled by an irregular mass of dentine They are sometimes confused with hypertrophy of the gums but the differentiation is easy as already indicated in the preceding paragraphs. The spindleform enlargement causes them to be regarded as perios-

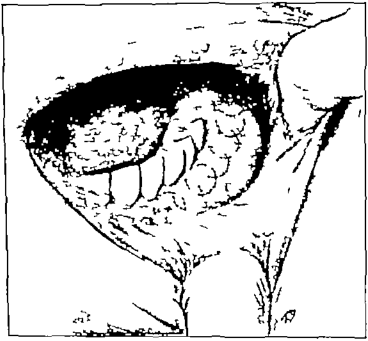


Fig. 101.—Dentigerous cyst of the lower jaw

teal sarcoma. It can be easily demonstrated by the x ray that the enlargement is due to expansion from within and not to thickening from without.

The surface of the bone is in part removed under local anes thesia (Fig 101) Enough of the outer shell of the bone must be removed in order to restore the symmetry of the face The interior of the cavity is then curetted out and packed with gauze These cavities become infected from the bacteria of the mouth and a rather foul smelling hole results This may be con trolled in a measure by mouth washes Finally the wound heals. Though this plan requires longer time than operating from the

skin of the cheek, it is the desirable method because the external scar is avoided

Diseases of the Antrum

Infections of the antrum may follow infections about the roots of teeth, particularly the eye teeth Great pain and constitutional reaction is caused with the escape of pus from the nares. In chronic cases bone may expand which may depress the hard

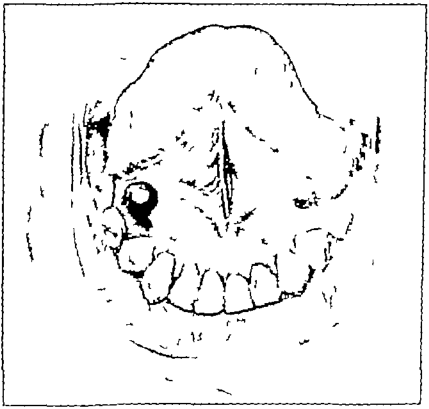


Fig. 102.—Odontoid exostoses of the lower jaw

palate like a growth within the antrum or may cause the cheek to bulge

The condition must be differentiated from inflammations of the alveolar border The escape of pus below the inferior turbinate is strongly suggestive and the x ray picture as well as transillumination may add evidence but only the direct aspiration of pus through the nares gives conclusive evidence

Wide drainage gives good results This is best accomplished by removing an area of bone below the inferior turbinate a

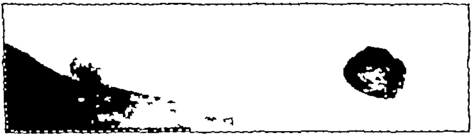
centimeter and a half long and half as broad Small openings close Washing through a trocar sometimes succeeds

Exostosis

Small bony outgrowths may occur extending either on the buccal surface (Fig 102) or on the outer surface (Fig 103) They are intensely hard and grow slowly and are generally pedunculated

They might be regarded as wholly innocent did not some one occasionally predict dire consequences and perform a needlessly radical operation

They are readily cracked off with a small chisel under local anesthesia



A B

FIG. 103.—Exostosis of the lower jaw A as seen under the x ray B as it appeared after removal.

DISEASES OF THE ALVEOLAR BORDER

The innocent granulomas the ubiquitous epulides and the devastating carcinomas make up the list of chief affections of the alveolar border

Infectious Granulomas

An infection about a tooth not infrequently produces exuberant granulations which when they reach a certain degree of dignity warrant the term granulomas. They spring up in a month or two attaining the size of a pea or grain of corn (Fig 104) If there are several they present quite a formidable sight. They are soft to the touch and bleed when roughly manipulated

They resemble the smooth epulides in general appearance but they spring up more quickly are softer a brighter red and bleed more easily When sectioned they present a picture of

many vessels surrounded by many small mononuclear cells. I have seen some distressingly radical operations performed because the laboratory pathologist knowing nothing of the source of the tissue diagnosed ' angiosarcoma

All that is needed in the way of treatment is destruction of the inflamed tissue from which they spring Eradication of the cause usually requires the service of the dentist because there is usually some chronic infection about the root of the tooth from which they spring



Fig 104.—Granuloma of the alveolar border

Abscesses of the Alveolar Border

Occasionally one sees slowly developing abscesses of the hard palate beginning at the alveolar border and extending backward. The process is somewhat similar to that causing pustules of the cheek but for some reason infections extending along the hard palate develop much more slowly (Fig 105) They sometimes develop so insidiously in fact that one thinks of neoplasm particularly a rapidly growing epulis Usually there is distinct fluctua

tion and an aspirating needle will settle any doubt. They usually are due to a low grade pyogenic infection though some have been described as due to tuberculous infection. To distinguish between the two is a matter of difficulty

Incision and drainage results in a cure no matter what the causative agent If due to perforation of the alveolar border

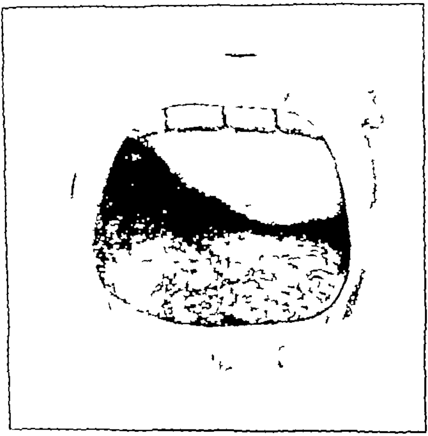


Fig. 101.—Chronic abscess of the hard palate.

from an infected tooth the tooth must be extracted or otherwise disposed of before the cure will be permanent. Sometimes there is superficial necrosis which requires curettage

Epulides

Epulides are fibrocellular tumors developing from the alveolar borders. They usually contain giant cells but these may be lacking The tumors develop from the periosteum and from the peridental membrane While they nearly always have their chief

point about the roots of one or more teeth they sometimes form on toothless gums having developed after the teeth were extracted. They vary in size from that of a pea (Fig 106) to that of a walnut (Fig 107) They appear as pinkish, reddish nodules, usually spherical, but sometimes they are nodular, particularly the more rapidly growing variety on the upper jaw (Fig 107) They usually grow slowly and may exist for years before showing any marked tendency to rapid development. On the other



Fig 106.—Small epuli growing between two lower incisor teeth.

hand the growth may be rapid particularly in those of the upper jaw especially when incompletely operated upon or otherwise irritated

When small they resemble the granulomas but they may be easily distinguished because they are covered by stratified squamous epithelium hence they do not bleed readily on manipulation and are firmer to the touch and there is usually a history of longer development Sometimes those on the upper jaw develop rapidly over the hard palate and one may obtain the history of

its development in a few days or weeks. When the development is confined chiefly to the palatal surface, one may think of a chronic abscess (Fig 108)

In their management a difference must be recognized between those of the lower and those of the upper jaw The latter show a much greater tendency to recur and take on vicious development Very small ones of slow development on the lower jaw

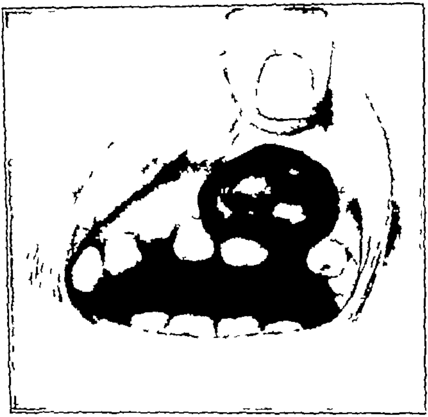


Fig. 107—Epulis of the upper jaw

may often be cured by careful removal about the tooth and jaw with gentle cauterization with the electrocautery The larger ones particularly if they have developed rapidly demand the sacrifice of the tooth or teeth about which they develop Some deformity can be spared in those involving the lower jaw by preserving the tooth socket merely curetting out the tooth cavity to be followed by a chemical or electric cautery This is particularly important in the front teeth where the removal of the alveolar border would leave a depression difficult to cover with

a bridge. On the upper jaw the procedure must be more radical, particularly from the bicuspid backward. Here the tooth or teeth including the alveolar border must always be sacrificed. This is accomplished under local anesthesia with the aid of small



Fig. 108.—Epulis of the hard palate which resembled an abscess and was injudiciously incised.



A B

Fig. 109.—Epulis of the upper jaw. A. After removal. B. Before removal.

rongeur forceps. An exception may be made in those springing about the roots of the incisors. Here a local removal without sacrifice of the teeth may be tried provided the patient can be under constant supervision so that a recurrence can be detected

early Once a wide area is invaded two or more teeth together with an area of the palate must be removed When the antrum has become invaded resection of that portion of the maxilla must be done, taking a considerable portion of one half of the hard palate and a part of the lateral wall of the antrum These defects are readily filled in by a prosthetic dentist. When a recurrence after a conservative operation takes place there must be a radical operation When done early a cure is quite certain (Fig 109) When a recurrence has invaded a wide area of

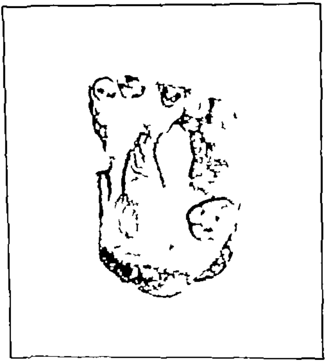


Fig. 110—Resected upper jaw for an extensive epulis.

the alveolar process and has invaded the antrum sufficiently to cause an expansion of the superior maxilla a complete resection of the jaw is demanded (Fig 110) even with an extensive operation recurrence is the rule In extensive jaw resection the best technic is to cut the soft parts with the cautery For this local anesthesia is required. The bony structures may then be chiseled through under some sort of general anesthesia By this means an extensive resection can be done without incising the cheek, a factor of great importance in women to whom a scar of the cheek is a serious blemish.

Sarcomas

Sarcomas of the jaw are very rare I have never seen one aside from the epulides Those I have seen which have been diagnosed *as such were granulomas cysts, or odontomas*

Carcinomas

Carcinomas of the jaw are common They may begin as papillary excrescences or as ulcers They very commonly develop about a broken tooth or a defective dental plate

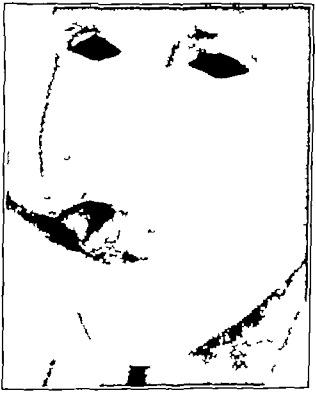


Fig. 111 —Papillary carcinoma of the lower jaw

Papillary Carcinoma

In papillary carcinoma a fungating mass develops along the alveolar border (Fig 111) starting in many instances about a broken tooth or a defective dental plate The excrescences are firm cauliflower like and may extend for some distance along the alveolar border When roughly manipulated they bleed

They are easily differentiated from the granulomas because they are much firmer and they are paler *in color and extend*

over a greater area It is only in the beginning that they resemble the epulides and then but slightly They are firmer and bleed when manipulated (epulides do not) and the surface is made up of many fine spires which contrast with the smooth border of the epulides

This variety gives a good prognosis after treatment In cases in which the teeth have not already been removed, these should first be pulled The gums together with the alveolar border should be removed It is best first to cut through with the electric cautery under local anesthesia and then to remove the bone with a rongeur Since this operation can be done with nerve blocking it is easy to use the cautery When the alveolar process is removed the artery is destroyed and must be controlled by packing or by ligation of the trunk. When controlled by packing secondary hemorrhage may take place which demands a hasty ligation. It is best to ligate the external carotid in case of secondary hemorrhage for this vessel is more readily reached than the isolated branch.

Ulcerous Carcinoma

In ulcerous carcinoma the lesion begins as an ulcer The borders are irregular and hard and bleed readily on touch. They often develop in jaws from which the teeth have already been removed

The firmness of the border distinguishes them from tuberculosis. Early actinomycotic lesions may resemble cancer closely In actinomycosis the ulcer may be as firm as in cancer but they do not bleed so easily when manipulated with the finger or instruments. Even with every precaution the diagnosis may be overlooked until the actinomycosis has invaded the superficial tissues and the telltale crateriform pustules result

In this type of cancer local excision as advised in the papillary type does not give good results It is better to resect the jaw This is done best by dissecting out the glands of the neck at the first sitting as advised by Bloodgood. At a later sitting a resection in continuity of the portion of the jaw involved is done The advantage of this two-stage operation is that the large neck wound is allowed to heal without being exposed to

the secretions of the mouth. Even with this radical procedure recurrence is the rule

Actinomycosis

Ulcerous lesions due to the ray fungus sometimes begin about the root of a tooth gradually extending producing a sluggish ulcer with hard, sharply defined walls (Fig 112) Sooner or later the surrounding tissue particularly the submaxillary lymph

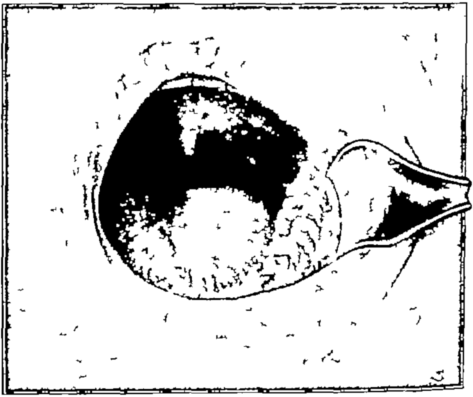


Fig. 112.—Actinomycosis of the jaw (The artist failed to continue the ulcer down about the wisdom tooth.)

glands become involved and a large indurated mass below the angle of the jaw is produced

This mass is very much like certain types of carcinoma in which there is extensive invasion of the submaxillary tissues. Even after the overlying skin breaks down producing the typical crateriform sinuses (Fig 113) characteristic of actinomycosis the diagnosis still is not easy for sometimes a carcinoma breaks down and forms a sinus The demonstration of the ray fungus

or the excision of a piece and the demonstration of cancer nests remove all doubts

If the lesion is recognized early, active cauterization is in order If the lymphatic tissue has been invaded, proper drain age with packs of iodine are useful Potassium iodide internally is the chief treatment. As large doses as can be borne are given for ten days and then the treatment is suspended for a like period when the iodides are again given This sequence is re-



Fig. 113 —Crateriform sinuses in actinomycosis.

peated indefinitely The injection of Lugol's solution directly into the tissues is very effective A small area is injected every day or two until the entire mass has been infiltrated The in jection of Lugol's solution directly into the tissues causes intense pain for a few hours which must be controlled with morphine.

DISEASES OF THE CHEEK

The cheek in general partakes of the diseases affecting the rest of the mouth and it also has a few characteristic of itself.

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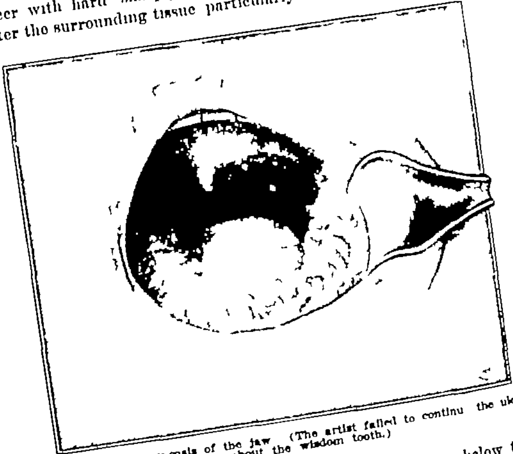


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Fig. 112 —Crateriform sinuses in actinomycosis.

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The cheek in general partakes of the diseases affecting the rest of the mouth and it also has a few characteristic of itself.

Leucoplakia

Leucoplakia is characterized by a peculiar piling up of the epithelium, giving the whole surface a milky white appearance. It gives no symptoms and is little prone, as in the case of the tongue and pharynx pillars, to develop malignancy

The pearly white appearance and the chronicity is characteristic. They must be distinguished from syphilitic lesions.

The patches may be removed with the electric cautery They may be caused to disappear by means of the x ray but when so destroyed they tend to recur



Fig. 116.—Cyst of a mucous gland of the cheek.

Cysts

Cysts usually the size of a wheat grain but sometimes as large as a hickory nut, are sometimes seen in the mucous glands of the cheek and lips (Fig 116) They are spherical, firm masses which glide freely about. Their bluish contents can usually be seen shining through their walls.

They may be mistaken for solitary lymph cysts but they are more definitely encapsulated than lymph cysts.

Excision sac and all provides a cure

Papillomas

Pedunculated fibrous tumors are often seen in the cheek. They are soft and because of the pedunculation tend to be caught be-

tween the teeth When large they cause marked interference with mastication (Fig 117)

Their soft character makes them easily recognized

They are best removed by excision at the base with an electric cautery

Sarcoma

Fortunately rarely a small round-celled sarcoma appears in the cheek. It begins as a globular mass which sooner or later bulges both the skin and mucous membrane It attains the size of a walnut usually in a few months.

It must be differentiated from wens The history of growth



Fig. 11 —Soft papilloma of the right cheek.

is more rapid in the sarcoma and it is softer It nearly always affects young girls

Excision is the treatment which will be most certainly followed by a return The x ray also gives temporary relief.

Carcinoma

Carcinomas of the cheek are often found adjacent to a ragged tooth. They are usually papillary in form and may spread over the entire surface of the buccal mucous membrane. The surface is rough cauliflower like but does not bleed easily They sometimes develop on the base of a leucoplakia. In this instance they tend to form ulcerous lesions

It can be mistaken for the soft papillomas of the cheek which

are usually solitary, however, and are always soft. The ulcerous type must be differentiated from tuberculosis. In the latter the edge of the ulcer is soft and undermined, while the borders are perpendicular and hard in carcinoma.

These tumors when seen early are cured by dissecting them out with the electrocautery. When neglected or maltreated they may extend into the depth of the cheek which then demands the sacrifice of the entire thickness of the cheek.

Less common carcinomas develop from a flat wart on the mucosa. These tend to invade the whole thickness of the cheek



Fig. 118.—Carcinoma of the cheek extending entirely through.

and form an ulcerating lesion on the skin of the face (Fig. 109). Complete excision is usually followed by a prolonged period of freedom from recurrence. In none of the carcinomas of the cheek is excision of the regional lymph nodes demanded unless it be the ulcerous type just mentioned.

DISEASES OF THE HARD PALATE

Aside from the infections already mentioned, syphilis is the chief lesion. A single large ulcer, which may entirely perforate the palate is the common type but superficial lesions are sometimes seen (Fig. 119). They can hardly be mistaken for any

other lesion Tuberculosis is exceedingly rare and can only be differentiated by the therapeutic test

The treatment is that of tertiary syphilis. Iodides and mercury give better results than salvarsan

Angioma

A circumscribed angioma is sometimes seen in the hard palate They are readily recognized by the bluish color and soft consistency They sometimes rupture and bleed tremendously They should be thoroughly destroyed with an electrocautery under local anesthesia.



Fig 119—Syphilis of the hard palate.

DISEASES OF THE FLOOR OF THE MOUTH

Inflammations, cysts and malignancies must be thought of when the floor of the mouth is suspected

Inflammations

Phlegmons appear from different causes as the lodgment of foreign bodies or from causes unknown. The picture is that of induration usually brawny with marked constitutional symp-

toms. Vincent's angina may play a part When this is the case typical organisms may be found (see section on tonsils) Ludwig's angina is a type of intense inflammatory infiltration involving the floor of the mouth and the structures of the neck. Not only the floor of the mouth but the submaxillary triangles are involved. A stone in the duct of the submaxillary gland (sialolith) often produces a diffuse infiltration of the floor of the mouth It is usually most intense on one side of the mouth (Fig



Fig. 120—Infection of the floor of the mouth due to a sialolith.

120) and generally by bimanual palpation a thickened ridge can be felt marking the location of the duct and its contained stone. Searching the indurated area with a sharp needle usually discloses a stone Sometimes the determination of the nature of the trouble is aided by the escape of pus from the outlet duct The determination of the cause of the inflammation of the floor of the mouth is not easy The sialolith may be felt and its unilateral character is suggestive The discovery of Vincent's spirillum is characteristic Wide induration by malignancy and

actinomycosis may resemble the more slowly developing form of pyogenic infection.

If a sialolith is the cause, the removal of the stone brings speedy relief. Vincent's angina is usually cured by the use of iodine locally and internally. Ludwig's angina demands wide



Fig. 121.—Abscess of the neck due to infection from within the floor of the mouth.

incision (Fig. 121). The woody phlegmon is best treated expectantly. Usually about nine months are required for the disappearance of the induration.

The extraction of the stone through a small incision through the mucosa cures the trouble.

Cysts

The most common cysts found in the floor of the mouth are the ranulas. They are retention cysts of the sublingual ducts. They appear as bluish elongated bodies (Fig. 122) beginning

laterally to the frenulum and extending outward and backward They may form masses of considerable size, seriously interfering with the movements of the tongue Occasionally they are large and present bulging masses in the submaxillary triangle

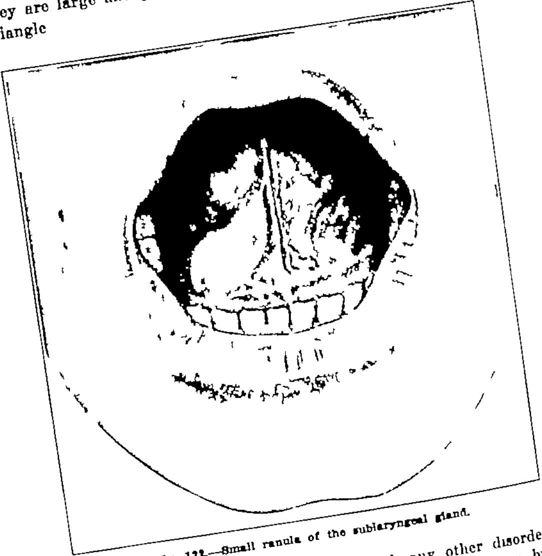


Fig. 122.—Small ranula of the sublaryngeal gland.

Ranulas can hardly be confused with any other disorder Sometimes cysts of the mucous glands form bluish tumors but they are globular and they do not maintain the typical relation to the frenulum so characteristic of ranulas

In the smaller ones the top may be clipped off and the interior of the remainder of the sac cauterized In the large ones which extend to the submaxillary triangle the sac may be obliterated

by swabbing it out with iodine and carbolic acid after opening it through the mouth and then packing the cavity with gauze In this procedure just the top of the tumor presenting under the tongue is cut off In males, in whom the scar is of less importance, it is better surgery to dissect out the entire sac through an incision in the submaxillary triangle



Fig. 123 —Carcinoma of the floor of the mouth.

Carcinomas

Carcinomas appear as superficial ulcers with hard, elevated borders and an irregular center (Fig 123) These often attain great size and develop distinct metastases in the neck before the original tumor is discovered. It is important in every tumor of the neck to inspect the floor of the mouth Once the tumor is discovered the diagnosis is easy

Tuberculous and syphilitic ulcers do not have the dense infiltrated borders which are so characteristic of carcinoma

These tumors are prone to early metastasis, therefore before treatment is instituted the whole body must be interrogated for possible metastasis If none exist, the ulcer may be destroyed with the cautery In old persons freedom from recurrence may be obtained, lasting several years

DISEASES OF THE TONGUE

The tongue as an object of scientific interest does not play the rôle in the life of the doctor that it formerly did and as a barometer of the bodily state it has fallen into disrepute Neverthe



Fig. 124—Dimple in the protruded tongue due to a thick fibrous frenulum.

less it might be consulted more frequently than it is for it still often conveys more information when looked at than when listened to There is no member of the body whose organic lesions are more often overlooked Every hospital could profitably employ an elderly physician of small learning, but keen of observation as official tongue inspector

Tongue Tie

Tongue tie this time honored deformity formerly played the rôle that chronic appendicitis does now On rainy days when

business was dull there were always *tongue tied children to have* their frenulums clipped After inspecting many hundreds of patients, I finally found one not brought for tongue tie, but because he had tonsils. The real thing may be described as fol lows the frenulum extends to the end of the tongue and when this member is protruded, it buckles and a dimple forms in the end which can scarcely be protruded beyond the teeth (Fig 124) When raised by the examiner s fingers, the frenulum is uncommonly heavy and broad and obviously prevents the tip of the tongue being raised (Fig 125) The only differentiation is between the real and the imaginary, and if one is not sure of its presence, one may be sure there is none The simple clipping

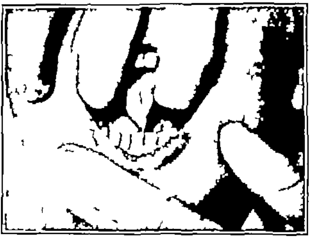


Fig. 125 —Tongue tie. The thick, heavy frenulum extends to the end of the tongue.

of the frenulum as practiced by our grandsires is not sufficient when one actually has this condition to deal with, but the clipping should be followed by the suture of the transverse incision in a longitudinal direction.

Glossitis

The tongue becomes inflamed in many conditions. Simple acute inflammation may attend a variety of acute diseases. The condition is often seen in mercury salivation to a less degree in many digestive disturbances Occasionally metastatic inflamma tions are seen in conjunction with generalized inflammations The cause should be determined when possible. Aseptic mouth

washes and attention to the underlying condition constitute the treatment. Chronic irritation, the thick, dry sore tongue is suggestive of pernicious anemia The ulcers indicate a bad state of general nutrition and usually a hyperacidity General tonics and antacids constitute the treatment In chronic digestive disorders a peculiar gyrated cast is formed designated dermographia Its cause and meaning are not certain and treatment is even less so Attention to the general health constitutes the treatment



Fig. 126 —Mild leucoplakia of the tongue.

Leucoplakia

In this peculiar affection of the tongue certain areas become covered by a heavy covering of silvery epithelium. It is equally common on the tongue gums, and the cheeks. When slight (Fig 126), there is no impairment of function but when the accumulation of scaly epithelial cells is great (Fig 127) impairment of function may be considerable and the pain annoying In such cases malignancy must always be suspected, as in the last mentioned figure a case I saw with Dr B L Myers

Diagnosis—The lesion is characteristic One needs only, theoretically at least, to think of the possibility of a mucous patch.

More important is the detection of early malignancy When malignancy begins, there is usually an enormous thickening of the lesion, or the border of the mucous membrane about the lesion is obviously thickened and hardened

Treatment.—When the lesion is slight and the area affected is slight, it may be ignored or the patient sent to the roentgenologist Sometimes very good results are obtained from the rays. Sometimes the primary lesion disappears quickly under the rays,

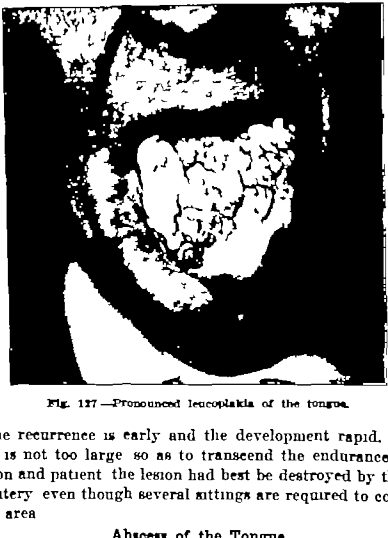


Fig. 127—Pronounced leucoplakia of the tongue.

but the recurrence is early and the development rapid. If the lesion is not too large so as to transcend the endurance of the surgeon and patient the lesion had best be destroyed by the electrocautery even though several sittings are required to cover the entire area

Abscess of the Tongue

Solitary abscess of the tongue is rare Usually there is pronounced inflammation of the tongue and when this has subsided an indurated area remains which in time softens (Fig 128)

If one is on the alert its presence may be detected before fluctuation develops The patient may be too sick to note this additional complaint and the practitioner is rewarded for his systematic tongue inspection.

It is the history of acute glossitis preceding that gives the clue If the history is not available, it must be differentiated from gumma and the still rarer lymph cysts Abscesses do develop insidiously, occasionally, in conjunction with abscesses elsewhere

The abscess, when located, must be opened No drain is needed because the walls at once collapse and the abundant circulation soon heals the lesion



Fig. 128 —Abscess of the left border of the tongue.

Lymph Cysts

Solitary lymph cysts are rare A gradual ovoid enlargement with occasional inflammation characterizes them. There is a history of recurrent attacks with complete remissions

One cannot differentiate them from abscess except by aspiration or incision.

Since treatment is incision for both, an exact diagnosis is not important. Lymph cysts must have the endothelial lining destroyed this may be readily done by draining them for a day or two with a pledget of gauze soaked in iodine

The polycystic lymph angiomas are more frequent and more

serious. They are made up of numerous small cysts appearing first usually on the tip Inspection may show little, but when palpated between thumb and finger the tongue is felt to be thick ened as though many shot were imbedded in it (Fig 129) At intervals the tongue becomes inflamed and after some weeks the inflammation subsides but the lesion will be found to have augmented in size. These exacerbations come on at intervals from six months to several years and in each interim the lesion will be found to be larger This continues until the whole half or even more of the tongue is involved. The time comes when



Fig. 129 —Lymphangioma of the tongue.

the mouth no longer can contain the swollen organ and the tip remains protruded from the teeth.

There is no other disease which resembles it. After the cysts become larger their bluish contents may show through the mucosa.

The treatment is excision with a plastic to fill in the defect. This is easily done under local anesthesia. The tongue is infil trated with novocaine solution and then sutures are passed through the unaffected portion. These serve as retention strings to prevent the tongue from retracting into the mouth. After the growth has been excised the sutures, already placed, are tied. The sutures are sufficient to control the hemorrhage unless

the lesion reaches the middle of the tongue or beyond, in which instance the lingual artery should be separately tied

This should be done while the lesion is small so that the repair of the defect will cause but little deformity of the tongue. I have seen them become violently inflamed following the use of the x ray Once they become large, incision of the entire tongue must be done.

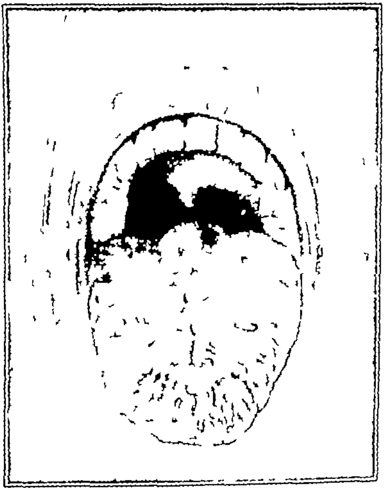


Fig. 130 —Thyroglossal cyst of the base of the tongue.

Thyroglossal Cysts

Cysts form at the terminus of the thyroglossal duct at the base of the tongue They appear as bluish elevations which are readily seen just over the summit of the dorsum of the tongue (Fig 130) The disturbance is wholly mechanical.

Their bluish color and ovoid form are characteristic This appearance may be simulated by a deeply seated lingual goiter The goiter, however is a deep red instead of blue and vessels can be seen coursing over the surface

They are cured by cutting off their tops and cauterizing the part remaining This is done by infiltrating an area of the

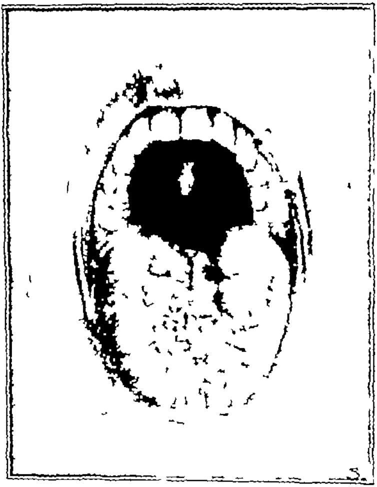


Fig. 121.—Gumma of the tongue.

tongue with novocaine solution and then passing a retention suture through this area The tongue is then drawn out as far as is comfortable for the patient The base of the cyst is then infiltrated and its top cut off with scissors. The interior of the sac remaining is then cauterized with trichloracetic acid. The traction suture is then removed and the tongue allowed to return to its place

Gumma

Chronic syphilitic lesions appear as elongated masses in one half of the tongue There is some pain and the elevation is oblique (Fig 131)

When gummas ulcerate forming a lesion with indurated walls, the differentiation between them and carcinoma and tuberculosis must be made. Gumma is the most rapidly developing of the three, but one sees carcinomas which, the patient states have developed in a few weeks Carcinoma has the hard border not



Fig. 132.—Cholesteatoma of the tongue.

attained in gumma Tuberculous ulcers have more deeply under mined edges and there is nearly always evidence of tuberculosis in the lungs. There is a rare lesion of the tongue that may cause one to think of gumma the so-called cholestomas They occur in the midline as solitary white nodules (Fig 132) which are composed of white scalv material resembling cholesteatoma of the mastoid lesion. Their long duration and white color are characteristic.

Gumma must be differentiated from solitary lymph cyst and chronic abscess. Aspiration will accomplish this but usually there are other signs of syphilis. Gummas usually develop more quickly than cysts and are more localized than an abscess. Po-

tassium iodide will prove the diagnosis by causing the mass to disappear

Treatment is begun with potassium iodide until the lesion disappears and then the cure is completed with mercury

Chancre

Primary syphilitic lesion of the tongue is rare They have the usual indurated feel about the ulceration characteristic of chancre There is pronounced reaction in the submaxillary lymph glands.

The spirochetes can usually be demonstrated They are most apt to be mistaken for carcinoma The acute adenitis should



Fig. 132.—Fibrous papilloma of the tongue.

prevent this error Chancres are usually seen in the young when carcinoma is exceedingly unlikely

These lesions should be cauterized and the patient treated with salvarsan in order to secure as rapid elimination of the lesion as possible.

Sarcoma

Sarcoma of the tongue is a rare disease All that I have seen were either syphilis or tuberculosis

Papilloma

A rather frequent lesion of the tongue is the simple epithelial wart They appear as small elevated lesions usually protruding from the side or the tip of the tongue (Figs. 133 and 134) They

may be composed entirely of fibrous tissue (fibrous papilloma) or chiefly of epithelial elements (epithelial papilloma) Neither type tends to become malignant and they cause trouble only by being pinched between the teeth

They can scarcely be mistaken for any other lesion because they are covered with an unchanged epithelium and the base is not infiltrated



Fig. 134 —Epithelial papilloma of the tongue.



Fig. 135 —Carcinoma of the tip of the tongue.

The best treatment is destruction by the electrocautery after infiltrating the base with novocaine solution

Carcinoma

Carcinomas of the tongue are common in males They frequently appear adjacent to jagged teeth or dental bridge work. Usually they cause indurated ulcers with hard borders which

often show the fine dots pathognomonic of carcinoma (Fig 135) Sometimes the ulcer is superficial the induration less (Fig 136) and the onset rapid In such cases the possibility of syph ilis must be considered The edge is always harder in carcinoma



Fig. 136.—Carcinoma of the tongue.



Fig. 137.—Tuberculosis of the tip of the tongue.

and the usual signs of syphilis are absent. If doubt exists a sec tion can be made but if this is done the destructive treatment must follow When there is metastasis, the dense smooth glands clinch the diagnosis.

The treatment is discouraging in the extreme Cure is scarcely to be hoped for Complete destruction with the cautery under

local anesthesia gives as good results as the most radical operation In young, flaccid patients recurrence is rapid and certain, while in older individuals, particularly if thin in build, a considerable freedom may be obtained.

Tuberculosis

Tuberculous lesions of the tongue may appear as ulcers or as *elevated tumors* The ulcers have deeply undermined edges which are soft and irregular The bottom is dirty, irregular, and flat (Fig 137) The fungating type may form a nodule as large as half a walnut and may be surprisingly hard. I once removed one of these in full confidence that it was a carcinoma.

Diagnosis.—Nearly always tuberculosis exists elsewhere. The ulcers must be differentiated from carcinoma, which is usually easy *enough because of the soft overhanging walls of the ulcer* The indurated type may form large masses which are quite firm, with little tendency to break down These patients usually come with the diagnosis of sarcoma The impaired health of the patient should cause a diligent search for tuberculosis elsewhere and when it is found it gives a presumptive diagnosis for the tongue lesion The proof must be in the microscopic examination of the lesion after removal. Skill and diligence are sometimes required to demonstrate it in the laboratory I once had to make a twelfth block before proof was found.

Treatment.—Tuberculous lesions are best cauterized. The general health must be looked after *Usually the lung lesion ends the* patient's life before much can be done for the tongue lesion.

CHAPTER VIII

DISEASES AND INJURIES OF THE FACE

The face is the site of an infinite number of minor injuries. Because of the excellent blood supply healing is rapid and the chief end in treatment is to obtain the best possible cosmetic results. In the field of tumors the simple and inconsequential develop side by side with the serious and their differentiation is of the utmost importance lest the serious be neglected or the simple be subjected to needlessly radical operation

Injuries

Since the advent of the automobile contact with broken pieces of the windshield furnishes the greatest number of injuries Next in frequency are the industrial accidents where some flying particle strikes the face Small children in their various explorations receive many minor cuts about the face

Diagnosis.—In any injury of the face any trauma of important structures must be noted Stenson's duct, the tear duct, and the facial nerves are the most important structures Their recognition is important so that the attendant may appraise the patient of possible subsequent disability so that he may not be blamed for its occurrence

Treatment.—Wounds of the face must be carefully coapted preferably by some nonabsorbable suture material such as horse hair or dermal suture Hemostasis should be carefully attended to Fine needles and thin sutures are essential. The suture should be removed in four days or less. If the edges of the wound are ragged they may require trimming in order to make a fine suture line possible It is always well to anesthetize the area about the wound with novocaine so that the repairs can be made carefully without annoyance from the movements or exclamations of the patient Young children should be anesthetized. Particles of foreign material that may be driven into the edges of the wound must be removed lest they show after heal

ing has taken place Any simple dressing is suitable but best of all is no dressing at all Careful union of the severed edges, then exposure to the air gives the best results When it is desirable to shield the wound from public gaze a small dressing held in place with adhesive is suitable Collodion dressings should be resorted to only when the wound is inconsequential, and the necessity of hiding the wound is great



FIG. 138.—Face injury resulting from striking the face on a cinder walk.

Blast Injuries

Injury from an explosion which drives fine particles into the skin is particularly annoying to manage Their multiplicity and small size make removal of the individual particles impossible. Once healing has taken place and the particles are covered by a scar nothing can be done The commonest types of such injuries are from dynamite blasts in stone and powder burns from the bursting of firearms In the former the particles are white and are less conspicuous than the powder burns though the

modern smokeless powder burns of the face are less common than in the old black powder days. With high pressure guns either there is an important laceration or the patient escapes unhurt Striking the face on a stone or cinder-covered walk may cause particles to become imbedded within the skin (Fig 138) In either case the best means of removing the particles is by scrubbing the injured surface with a stiff hard brush which removes mechanically fragments from the small wounds in which they lie imbedded The larger particles may be removed by the fine point of a knife

Infected Wounds

Usually wounds of the face heal by primary union *Occasion*ally the wound suppurates, particularly in regions where the cellular tissue is most abundant Careful cleansing with formalin and exposure to the air bring quick results. Occasionally more serious infections occur When these are situated in regions of veins which drain into the cerebral cavity they should receive careful attention. Chemical sterilization with formalin or iodine should be followed by hot packs. This tends to produce local infiltration best calculated to combat the infection

Contused Wounds

Injury by a blunt object may produce a simple contusion or a hematoma (Fig 139) Such a hematoma may mask a depressed fracture of the superior maxilla. A depression of the superior maxilla is of cosmetic importance only but this is sufficient reason for exploring the hematoma in order to determine whether there is bone injury beneath. It is not necessary to incise the hematoma but a small incision which permits the blood to escape makes it possible to palpate the outlines of the bone. In case of doubt an x ray picture should be secured. If the bone is depressed it may be elevated by inserting a sharp hook, and by lifting firmly the depressed bone can be readily elevated. In some instances this means does not avail, and the bone must be elevated through a wound in the soft parts and an opening in the bone. A very annoying oversight is a fracture of the zygomatic arch or the styloid process of the inferior maxilla The swelling or hematoma may hide the injury to the bone

In fracture of either the zygomatic arch or the styloid process of the inferior maxilla, there may be pressure on the articular region, hindering the movements of the lower jaw A locking of the jaw may not be apparent at once after the injury because the fragments are still mobile As healing gradually takes place, the movement is more and more hindered In important injuries of the zygomatic region an x ray examination should always be made If the arch is depressed it must be elevated.



FIG. 139 —Hematoma of the cheek due to a blunt injury

Infections

Spontaneous infections about the face are of more serious import than infections following trauma. This is particularly true in deep-seated infections of the lips or of the parotid gland.

Furuncles

Furuncles may appear on any part of the face Common boils are found most frequently about the cheek or neck (Fig 140) Much more important are those situated at the angle of the nose (Fig 141) or on the lower lip (Fig 142) The reason they are so serious at these points is that the infection is apt to involve the angular vein and travel hence to the cerebral sinuses. These infections usually begin in small pustules just below the ala of the nose and may proceed from a small fissure in the nose or about a hair

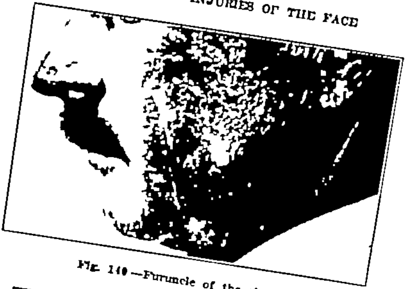


Fig. 140.—Furuncle of the cheek.

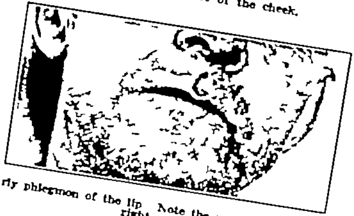


Fig. 141.—Early phlegmon of the lip. Note the swelling at the entrance of the right nostril.



Fig. 14[illegible].—Furunculosis of the lower lip.

follicle. Generally it is some manipulation of the pustule that causes the infection to extend. Usually the lip becomes markedly swollen and painful and there is increase of the temperature and the pulse rate. Sometimes there is tenderness over the

angular vein Temperature and leucocytosis usually develop early When the vein becomes involved and the infection extends to the sinus, high fever and delirium are common

Diagnosis.—Usually the history of a pustule gives the clue to the nature of the trouble Erysipelas also begins about the nose in many instances and must be differentiated Erysipelas *begins more abruptly than the infection and the border is more* sharply defined Once the disease is in full progress there is little difference The interior of the cranium is endangered in both The prognosis, however, is much better in erysipelas.

Treatment.—The lesion is best treated by covering with a 5 per cent salicylic acid ointment until the surface is broken and the pus escapes spontaneously or hot packs may be applied. Better *still the ointment and hot packs may be used during* alternate hours. If there is tenderness along the vein it indicates that the infection is no longer confined to the area of primary infection In such cases some surgeons make a deep incision along the line of the angular vein keeping the edges of the wound apart by means of light gauze packs. Once the infection has reached the vein it is seldom that any treatment is of avail

Erysipelas

The alae of the nose are frequently the point of beginning of this disease it occurs less often about the angles of eyelids or about the ears Marked fever and rapid pulse mark the onset The red flush of the skin with the peculiar brawny feel is apparent early The abrupt line *of demarcation between the* affected and unaffected areas is particularly striking The lines of the face become obliterated and the eye may be partly closed (Fig 143) The extension proceeds gradually along this border In five to seven days the area first affected begins to clear *Occasionally* deep abscesses form

Diagnosis—The fever redness and the sharp border is pathognomonic Infections about the alae of the nose begin more slowly and lack the line of demarcation A variety of dermatoses are sometimes mistaken for erysipelas. Such lesions are not attended by fever which is always present in erysipelas.

Treatment.—Application of saturated solutions of magnesium sulphate is as efficient as any It is essentially a self limited disease

Barber's Itch

Multiple abscesses are sometimes formed about hair shafts and since it is most frequently disseminated by the barber it is



Fig. 143.—Erysipelas of face, showing characteristic edema. (From Sutton Diseases of the Skin.)

designated barber s itch though the feature of itching is the minor complaint.

The condition is best treated by pulling out each individual hair shaft and then applying sulphur salicylic ointment.

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Impetigo Contagiosa

Impetigo contagiosa is most often seen in epidemic form in children. The beginning maculation with the subsequent formation of a scab is sufficiently characteristic, but when seen in solitary cases in adults, it may be more confusing. But the extensive scabbing and its rapid onset is sufficient to stamp it. An ointment of ammoniated mercury expedites the disappearance.

Ringworm

Ringworm is sometimes attended on the face by extensive induration with little tendency for the center to clear. The cir



Fig. 144.—Hairy birthmark of the cheek.

cular form and the slight degree of deep infection makes its recognition fairly certain.

The treatment consists in the frequent application of an 8 per cent sodium hyposulphite solution or a salicylic ointment with sulphur.

Deformities

The *minor deformities of the face are confined* to the malformation of the upper lip. Fissures of the lower lip, the angle of the mouth and the outer canthus of the eyes are rarities. The technic of closure is a problem of major surgery. It need only be stated here that the time of closure in the minds of most surgeons is as early as possible after birth, usually when the child is about three weeks old. This early closure allows the

lips and cheeks to develop in a normal manner and it has much influence on the narrowing of the cleft in the palate if one exists.

Hairy Birthmarks

Hairy birthmarks may consist of only a small tuft of hair (Fig 144) or a considerable area of a cheek may be involved. Usually there is an accompanying capillary dilatation When the area is small, it may be excised or cauterized. The larger areas are best treated by a dermatologist skilled in the use of carbon dioxide snow



Fig. 145.—Wen on the cheek. The thinned skin covering the tumor is clearly seen.

Tumors

The tumors of the face present a most important field for every practitioner and the differentiation is by no means easy, hence detailed consideration is warranted. They may be considered according to their structure

Wens

Sebaceous cysts of the face are not common. They appear as hard, deeply imbedded tumors Because of the lack of a firm base they do not protrude from the surface of the cheek as

they do on the cranium (Fig 145) but appear as slight elevations Their globular feel and unchanged skin and their deep situation characterize them They are more prone to suppurate and to undergo malignant change in this location than those situated elsewhere They must be excised, remembering always the Stenson s duct and the branches of the facial nerve

Dermoids

Dermoids near the outer canthus of the eye are frequently observed They are attached at their base and the skin is freely movable over them The side of the nose is also a frequent site



Fig. 146 —Dermoid of nose.

(Fig 146) They appear as smooth tumors of long duration. They must be distinguished from cysts of the tear sac. Occasionally meningoceles (Fig 147) occur in this region and must be distinguished They are congenital the skin covering is thin and frequently they are somewhat compressible Dermoids are easily removed, meningoceles require great care lest meningitis follow

Lymph Cysts

The common seat of lymph cysts is about the eyes the eyelids, temple and upper face (Fig 148) They vary in size from a millet seed to that of a pea They stand out above the skin as a more or less perfect spheroid. They are translucent, the

surface is smooth, giving the appearance of a pearl imbedded under a thin epidermis They cause no inconvenience other than esthetic distress They are best dissected out or they may be clipped off and the base cauterized



Fig. 147.—Meningocele of cribriform plate.



Fig. 148.—Lymph cyst of the outer canthus of the left eye.

Lymphangiomas

Closely associated with lymph cysts are the lymphangiomas, differing from them only in their complexity Instead of a single elevated lesion being present a diffuse area is involved, producing a marked elevation of the affected part. They are made up of countless cavities of various size The skin over them is not much changed, and aside from the increase of bulk

they cause, they are innocent. The common site is the cheek (macrocheilia) or the lips (macromelia, Fig 149)

Diagnosis.—Lymphangiomas are distinguished by the soft feel, their compressibility, and by the normal skin covering Hem angiomas usually show blue through the skin and they disappear on pressure, in children they become augmented when the child cries Those unacquainted with the physical characters of lymphangiomas usually mistake them for lipomas. This error is easily avoided if one remembers that lipomas are circumscribed tumors, while lymphangiomas are not so well circumscribed Furthermore, the location in the cheek or lip is not imitated by lipomas



Fig 149—Lymphangioma of the lip.

Treatment.—Sometimes lymphangiomas respond to x ray treat ment In the lip they are best cured by excising a wedge-shaped piece and then closing the defect by several buried su tures in addition to the layer approximating the mucosa Those of the cheek require excision—a delicate and time-consuming procedure It is best to wait until the child is several years old before the operation is undertaken because very small children bear the unavoidable loss of blood badly

Hemangiomas

Dilated *blood vessels of the face* present several different types The superficial wine-colored birthmarks present a dila tation of the capillaries (Fig 150) They may be destroyed by

carbon dioxide snow or by cutting off the surface as in making a Thiersch skin graft and then transplanting normal skin over it If the tissue is removed deeply enough, the vessels may become obliterated without a transplant. This method cannot be used except in lesions small enough to permit epithelization from the circumference The transplant has the objection of being pearly white at least for a long time and this is about as con spicuous as the red surface which it replaces. Generally speak ing no plan of treatment yet devised is entirely satisfactory either to the patient or to the surgeon The best results I have



Fig. 150—Capillary hemangioma covering the entire right side of the face.

seen were obtained by a skilled dermatologist by the use of carbon dioxide snow

When the deeper cavernous type vessels are involved a de formity (Fig 151) is produced. The commoner sites of these are on the temples and at the tip of the nose. These present soft, elevated tumors which are compressible and become distended by any act which increases the intraocular pressure Sometimes they are covered wholly or in part with normal skin, but usually the skin is thinned over the summit and the tumor appears as a soft bluish elevation In this type offending vessels must be obliterated. If there is a definite periphery these

vessels may be sought and obliterated as described for angiomas of the forehead Hot water judiciously injected into the body of the tumor may secure good results The water must be introduced as hot as possible, and one must be sure the needle is not in a vein when the water is injected. The idea is to inject the water between the veins and not into one. In the very large ones it is best to attempt to secure the feeding vessels by ligatures. As many of these as can be located should be ligated before the main tumor is attacked.

When the dilated vessels involve the lip (Fig 152), it is best to excise a wedge-shaped piece and close it in layers as described for lymphangiomas of the lip (macrocheilia) The flow of blood during the operation may be controlled by placing a serrefine at either angle of the mouth. This is better than depending on the finger of an assistant One does not have to contend with the obstruction to the view caused by the presence of the hands, and the instruments do not get tired



Fig. 151.—Cavernous hemangioma of the face.

In the cavernous type involving most often the cheek or temple, the problem is more serious These tumors are often as large as half an apple and extend deeply within the tissues and are fed by large vessels. For this reason their management is a more or less formidable procedure. When they are seen in young

babies treatment is best postponed until the child is several years old because small babies bear the loss of blood badly It is perhaps safest to pass an interlocking stitch through the edge of the tumor and through the skin In this way many of the



Fig. 152.—Hemangioma of the lip.

vessels can be controlled. If possible the larger veins may be definitely ligated through an incision, but in many instances no definite trunk can be discovered.

Adenomas

Affections of the skin glands are frequently observed on the face They are seen most often about the ala of the nose and about the eyes. They appear as somewhat elevated firm nodules which are fairly well defined from the surrounding skin (Fig 153) Usually the surface is brownish, often faintly lobulated and they are nearly always considerably elevated above the skin. They tend very slightly to become malignant unless unduly irritated. They manifest this tendency by increasing size and lobulation (Fig 154) Later on the surface may ulcerate (Fig 155) and finally the entire tumor is destroyed by the ulcerous process

and but a crateriform lesion with a rim of edematous tissue remains

Adenomas of the nose (Fig 156) are particularly prone to become mildly malignant They grow slowly usually, but when irritated by cancer plasters they may take on rapid develop-



Fig. 153.—Adenoma of the lip



Fig. 154.—Adenoma of the lip which has formed new nodules through irritation by the x ray It has not yet become *malignant* but wide *removal* of the lip is now necessary

ment (*Fig 157*) Somewhat resembling these malignant adenomas are the perfectly innocent rhinophymas. They are formed by an overdevelopment of the fat glands which may produce pronounced enlargement of the end of the nose (Fig 158-*A*)

The remedy is simple The end of the nose is blocked off with novocaine and then the excess is shaved off until the desired shape is attained (Fig 158-B) There is no need to graft skin The surface becomes epithelialized in two to three weeks The bleeding is checked by gauze compresses Once bleeding has



Fig. 163—Adenoma of the upper lip which has become malignant.



Fig. 164.—Adenoma of the nose cured by local excision.

ceased no covering is needed Healing takes place best when the wound is exposed to the air

When seen early adenomas of the nose are cured by simple excision When they occur on the tip of the nose, they must be cut close to the cartilage together with a small margin of unaf

fected skin. After they have become ulcerous (Fig 159), the entire tip of the nose must be sacrificed and a new nose made



Fig. 157.—Adenoma of the nose cured by local excision.



A B

Fig. 158.—Rhinophyma. A. Shows the lobulations. B Nose after the redundant tissue has been removed.

the best one can. These tumors do not respond well to radiation. When irritated they tend to form new nodules about the periphery

Tumors of the Parotid Region

The most common tumors of the parotid are the mixed tumors. Adenomas cysts and malignant adenomas are less common



Fig. 159 —Carcinoma of the nose requiring excision.

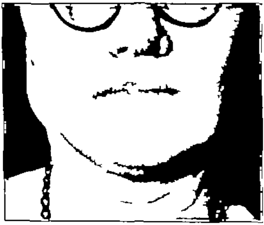


Fig. 160 —Small uniform mixed tumor of the parotid.

Mixed Tumors

Mixed tumors are characterized by their slow growth, their generally innocent character tending to malignancy only after many years A history of slow growth, even as long as forty years, is not unusual. When they do become malignant, it is not pronounced and may be cured by radical operation even after

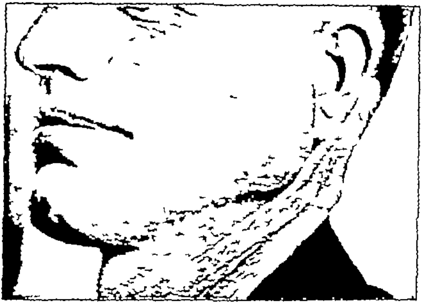


Fig. 161.—Moderately large uniform mixed tumor of the parotid.



Fig. 162.—Moderately large protuberant mixed tumor of the parotid.

being imperfectly operated on and lymph gland metastasis has taken place

They usually appear at the lower part of the gland as a smooth (Fig 160) elastic tumor In some cases the entire gland area is involved (Fig 161) As they become larger they become protuberant (Fig 162) and when they reach a large size they become lobulated even pendant (Fig 163)



Fig 163—Large lobulated mixed tumor of the parotid.

Diagnosis.—Their location in front and below the ear, their nodular outline and slow growth is characteristic. Sometimes they develop low down and the surface is smooth In such cases the connection with the parotid may not be certain. The very slow growth is the important point They must be differentiated from cysts adenomas, carcinomas, and lipomas. Cysts are smooth and elastic not bosselated as the mixed tumors. The adenomas are softer the carcinomas not encapsulated and the

rate of growth is more rapid. They are usually situated higher up in the gland and can usually be distinguished by a glance (Fig 164) Lipomas are softer and not lobulated.

Treatment—When removed they do not return. They not infrequently grow about the facial nerve, in which case the technic of removal is tedious After they have become malignant the whole gland as well as the facial nerve must be sacrificed. Even with such a radical operation they usually return.



Fig. 164—Carcinoma of the parotid.

Adenomas

Adenomas appear as encapsulated tumors as big as a pea or hazelnut, occasionally as large as a walnut or larger They are usually found in the superficial parts of the gland They glide about slightly under palpation. They are of denser consistency than the gland proper but less so than the mixed tumors.

Diagnosis.—When small they must be differentiated from the enlargement of a lymph gland found lying over the gland. An inflamed gland is usually oblong and is tender on pressure if acutely inflamed. Mixed tumors, as already noted, when small must be differentiated from adenomas They are usually situated in the lower part of the gland, while the adenomas are in the middle or upper part Usually the mixed tumors are larger when first seen than adenomas usually become. In many instances a differentiation must be made from the slide.

Treatment.—The adenomas are readily removed and the cure is permanent The branch of the facial nerve supplying the



Fig. 165.—Keratosis of the cheek.

eyelid crosses the parotid, passing upward and forward. If the incision is carried too far forward, *there is danger of wounding this nerve*. When the adenoma is situated low down the main trunk of the facial nerve must be avoided.

Keratosis

The face is frequently the site of keratotic lesions, small areas made up of piles of dead epithelial cells The most common site of these lesions is the cheek (Fig 165), the nose and the lips (Fig 166) The scaly covering of the lesion falls off and the

skin is smooth, but the cells are soon replaced. This condition may continue to repeat itself for many years without notable change. In many, however, the change occurs in which small bleeding points are seen when the scaling epithelium is removed. This presages malignancy. The further changes will be discussed under the basal celled epitheliomas.

The keratotic lesions are well cared for by x ray or radium. They usually clear up with one or two treatments. In the absence of these agencies salicylic sulphur ointment sometimes

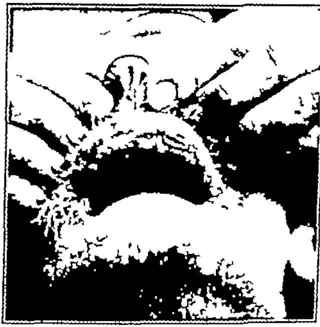


Fig. 166.—Keratosis of the upper lip.

gives results in the early stage of the lesion. The superficial cauterization by the electric cautery is a convenient and certain means of getting rid of them when the early cancerous stage is approached.

Papillomas (Warts)

The fibrous warts are often seen on the face and exist only as blemishes. They are often pedunculated and the surface is made up of many small bosselations (Fig. 167). Small wart like structures which occur on the face may be mentioned here. They are benign cystic epitheliomas (Fig. 168). They are superficial slowly growing tumors often showing small bluish

cysts on the surface They do not tend to become malignant They are seen most commonly about the temple and nose They remain many years unchanged but sooner or later many

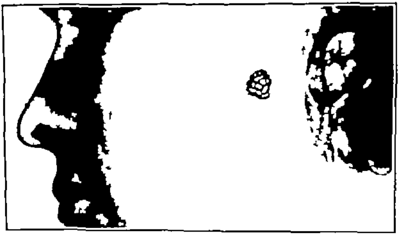


Fig. 167.—Fibrous wart.



Fig. 168.—Benign cystic epithelioma of the cheek.

of them show infiltration about the base (Fig 169) Later on the surface ulcerates (Fig 170) These changes are particularly apt to occur after being irritated by some acid or by tying

off the base with a string Possibly they were already on the way to malignancy and the increased activity led to the application of the string or acid They manifest malignancy by ulceration about their bases which, when manipulated, causes them to bleed. Some of these are relatively little malignant, but others



Fig. 169—Old wart of the cheek beginning malignant change.



Fig. 170—Ulcerating wart beginning malignancy

show a high degree of malignancy Those situated on the lip and near the angle of the jaw are usually malignant, while those located on the cheeks and nose are less so

Diagnosis—When the skin adjacent to the base of a wart is soft, the lesion is likely benign. When the wart ulcerates and the skin about the base is infiltrated it is likely *malignant*.

Treatment.—These lesions should always be removed because of this tendency to malignancy Excision with the knife or cautery is the best treatment The x ray and radium do not give good results in protuberant lesions.

Pigmented Warts

The face is not a frequent site for pigmented warts Usually they are small and little disposed to become malignant The exception to this general rule is those situated just in front of the ear In this situation they are prone to be larger more elevated, and not infrequently they become malignant showing in this tendency the characteristic of those of the temple already



Fig. 171 —Epithelioma of the nose.

discussed. They should always be definitely removed by sharp dissection. The cautery or x ray should not be used on melanotic warts.

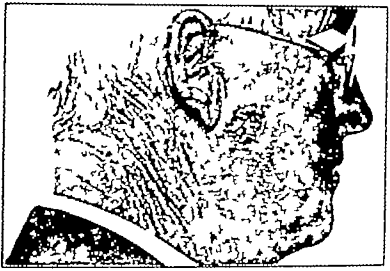
Carcinomas

Malignant epithelial tumors of the face are among the most benign and the most malignant of this variety of tumor The basal-celled epitheliomas and the spindle-celled cancers of the skin represent very divergent lesions

Basal-Celled Carcinomas

Basal-celled carcinomas are made up of slowly growing superficial ulcerations having as their most frequent site the area between the level of the eyebrow and the angle of the mouth

They may begin as small papillomas or as superficial scaling lesions (Fig 171) The latter is most characteristic. At first there is a patch covered by small silvery scales. These fall off or are removed, but they form again After a time there are fine



A



B

Fig. 172.—Early epithelioma of the cheek. *A* Showing superficial ulceration. *B* Defect remaining after the lesion has been excised with the cautery

bleeding points when the scales are removed. The lesion is already malignant Then the scale is replaced by a scab The site begins to ulcerate (Fig 172) The progression is very slow and years may be covered before the ulceration finally takes place The growth is so slow that partial healing may take place

in some parts of the ulcer Save for the scab and the occasional bleeding the patient suffers no inconvenience The growth is

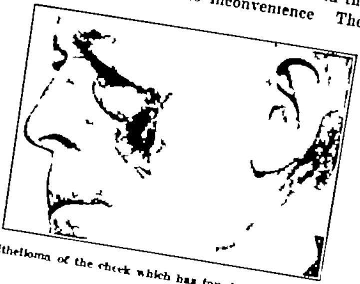


Fig. 1 3.—Epithelioma of the cheek which has invaded the conjunctival mucosa.



Fig. 1 4 —Basal-celled carcinoma of the alae of the nose.

insidious and after many years larger areas may become involved covering even the entire face

Leisurely as the rate of growth is so long as it invades only the skin surfaces as soon as it reaches a mucous surface such

as the conjunctiva (Fig 173) or the mucosa of the nose (Fig 174) it becomes rapid and the process becomes wholly relentless.

Diagnosis—The superficial ulcer beginning slowly as a keratotic lesion is quite characteristic Lupus vulgaris likewise



Fig. 175.—Lupus vulgaris. (From Sutton Diseases of the Skin.)



Fig 176.—Ulcerating tuberculous lesions of the cheek.

grows slowly and presents only a superficial lesion (Fig 175) The borders of tuberculous lesions are soft and overhanging (Fig 176) If the border of the ulcer is pressed upon with a glass slide, brownish nodules are seen dotted in the blanched nor

mal skin Syphilitic lesions are reniform, develop more quickly, and the background is homogeneous.

Treatment.—In the treatment of this lesion the x rays find their greatest success. The lesions are quickly healed, leave a smooth scar, and show no tendency to recur They may also be cured by cautery or by excision In small growths the cautery is quicker and cheaper than x ray This gives a cure that is certain in good hands and leaves little scarring The cautery may be used as the method of election in small lesions. It should burn through the skin and a few lines beyond the border of the ulcer Excision is rapid and convenient and the scarring is slight when the lesions are small



Fig 177—Prickle-celled carcinoma of the cheek.

Once the lesion extends to the mucosa nothing will stop it. Wide excision is the most reliable and this usually fails

Prickle-Celled Carcinomas

Prickle-celled carcinomas are the most common of the serious tumors of the face. Warty prickle-celled tumors sometimes occur on the cheek (Fig 177) They tend to fungate early and may extend entirely through the cheek, producing an elevated ulcerous lesion inside the mouth as well as on the cheek. Prickle-celled carcinomas occur by far the most common on the lower lips of males. A variety of types and stages may be distinguished.

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Fig. 1 —Lupus vulgaris. (From Sutton Diseases of the Skin.)



Fig 174 —Ulcerating tuberculous lesions of the cheek.

grows slowly and presents only a superficial lesion (Fig 175) The borders of tuberculous lesions are soft and overhanging (Fig 176) If the border of the ulcer is pressed upon with a glass slide, brownish nodules are seen dotted in the blanched nor

mal skin. Syphilitic lesions are reniform, develop more quickly, and the background is homogeneous.

Treatment.—In the treatment of this lesion the x rays find their greatest success. The lesions are quickly healed, leave a smooth scar, and show *no tendency to recur* They may also be cured by cautery or by excision. In small growths the cautery is quicker and cheaper than x ray This gives a cure that is certain in good hands and leaves little scarring The cautery may be used as the method of election in small lesions. It should burn through the skin and a few lines beyond the border of the ulcer Excision is rapid and convenient and the scarring is slight when the lesions are small



Fig 177—Prickle-celled carcinoma of the cheek.

Once the lesion extends to the mucosa nothing will stop it. Wide excision is the most reliable and this usually fails.

Prickle-Celled Carcinomas

Prickle-celled carcinomas are the most common of the serious tumors of the face Warty prickle-celled tumors sometimes occur on the cheek (Fig 177) They tend to fungate early and may extend entirely through the cheek, producing an elevated ulcerous lesion inside the mouth as well as on the cheek. Prickle celled carcinomas occur by far the most common on the lower lips of males A variety of types and stages may be distinguished.

as the conjunctiva (Fig 173) or the mucosa of the nose (Fig 174) it becomes rapid and the process becomes wholly relentless.

Diagnosis—The superficial ulcer beginning slowly as a keratotic lesion is quite characteristic Lupus vulgaris likewise



Fig 175—Lupus vulgaris. (From Sutton Diseases of the Skin)



Fig 176—Ulcerating tuberculous lesions of the cheek.

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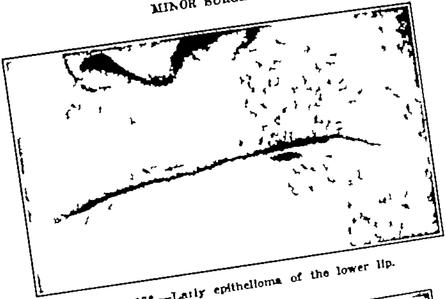


Fig. 178.—Early epithelioma of the lower lip.

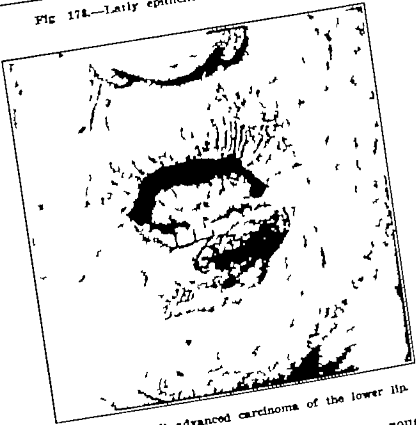


Fig. 179.—Well advanced carcinoma of the lower lip.

Flat Diffuse.—Not infrequently the lip becomes rough and is covered with scaling epidermis sometimes augmented in volume by dried secretion. This is the keratotic stage already mentioned. This condition may exist for several weeks or months and then clear up. After a period of freedom the condition re-

turns. Such cycles may be repeated for a period of years the condition remains permanent (Fig 178) and a malign has become superimposed This sequela instead of resulti a relatively benign basal-celled carcinoma as follows the



Fig 180 —Early epithelioma of the lip.

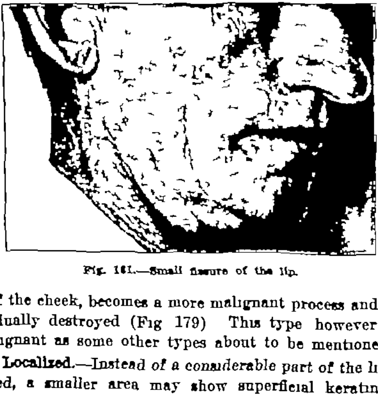


Fig. 181.—Small fissure of the lip.

tosis of the cheek, becomes a more malignant process and the lip is gradually destroyed (Fig 179) This type however is not so malignant as some other types about to be mentioned.

Flat Localized.—*Instead of a considerable part of the lip being* involved, a smaller area may show superficial keratinization.

These tend, particularly in young subjects, to infiltrate the mucosa and soon a definite mass is palpable giving the physical signs of malignancy (Fig 180) As these extend a definite nodular mass is formed.



Fig 182.—Warty type of epithelioma of the lip.

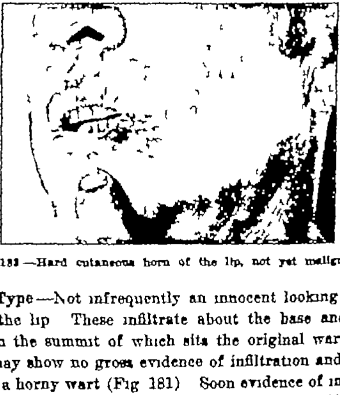


Fig. 181 —Hard cutaneous horn of the lip, not yet malignant.

Warty Type—Not infrequently an innocent looking wart appears on the lip These infiltrate about the base and a mass appears on the summit of which sits the original wart. Early the base may show no gross evidence of infiltration and one suspects only a horny wart (Fig 181) Soon evidence of infiltration appears. In time the surface ulcerates and the wart disappears,

but the process down to the lip continues (Fig 182) In my experience this type is most prone to early metastasis.

Fissured Type—A 'crack' in the lip must always be regarded with suspicion Particularly in those working out of



Fig. 184.—Ulcer of lip resulting from a recurrent fissure.



Fig. 185.—Superficial ulceration in a large epithelioma of the lip.

doors, cracks' develop in the lip (Fig 183) which disappear with or without treatment With recurrence they tend to remain longer After a time they become indurated and finally ulcerate (Fig 184) and destroy the lip When seen early they should be

destroyed by the cautery or excised. If they continue they are prone to become more and more indurated and finally ulcerate

Nodular Type—Sometimes the initial lesion is a nodule. There is a thickened area in the lip with a keratotic lesion of the superficial epithelium A large mass may form in the lip before the mucosa and skin are destroyed (Fig 185) This type is often accompanied by massed metastasis in the submaxillary lymph glands, producing a swelling simulating Ludwig's angina. They are very malignant

Diagnosis—Any of the preceding lesions may be detected as having become malignant when the indurated area becomes hard and cartilaginous Usually very fine white dots may be detected by the naked eye These points may sometimes be expressed



Fig. 186.—Chancre of the upper lip.

out like comedones and the cell structure demonstrated on the slide This is pathognomonic The detection of metastasis in the cervical lymphatics is nearly certain when they are found to be small and shot like and very hard They are usually found in the submental or submaxillary triangles.

Few lesions can be confused with carcinomas of the lip A keratotic lesion, a small wart or a fissure must always be regarded with apprehension. As soon as there is any induration in the mucosa one may be reasonably sure that malignancy has begun Other lesions are seldom mistaken for carcinoma. They are most often seen on the upper lip a very unusual occurrence for a cancer Chancres of the lip are sometimes mistaken for carcinomas (Fig 186) They are acute in onset and the submental lymph glands are large and painful to pressure Be-

sides the spirochetes should be recovered from such an initial lesion I once mistook a trichinal lesion for a carcinoma There was no excuse for it, besides an ulcerous lesion it bore no resemblance to carcinoma The borders were soft and elastic and there were no cancer dots in the border Rarely a granuloma develops on the lip and persists for many months (Fig 187) These granulomas have the usual history of granulomas elsewhere a definite acute lesion and a slow healing process. The growths bleed fairly easily but are soft when palpated with two fingers.

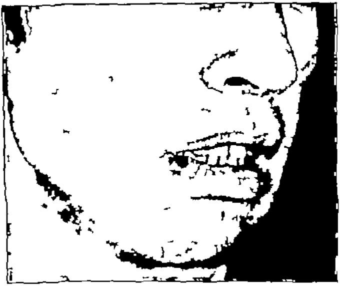


Fig. 187.—Granuloma of the lip of four months' duration.

Treatment—In the early stages when all carcinomas of the lip should be recognized thorough destruction with the cautery should result in cure The orthodox treatment for well established malignancy is wide local excision and blocking out of the adjacent lymphatic areas. My best results have followed wide local excision with the electric cautery as the first step After this cauterized area has thoroughly healed and there is no evidence of recurrence the necessary plastic operation may be done on the lip Dissecting out the lymph glands is well justified according to the rules of present procedure but never in my experience has a cure been obtained once the cervical lymph glands were invaded, no matter how radical the operation.

CHAPTER IX

AFFECTIONS OF THE NECK

Confronted by an affection of the neck the surgeon must take a rapid inventory in order to classify roughly the condition. The malformations are obvious, but the congenital conditions are not always so The inflammatory and tumorous conditions are often indefinitely defined and the question of whether tumors are primary or metastatic often is not decided until the diagnosis has been completed, hence it is that diagnosis by exclusion is well nigh impossible

CONGENITAL DISEASES OF THE NECK

Of the malformations wryneck and spina bifida are the most common The congenital lesions are represented chiefly by the disturbances in development of the gill cleft system

Torticollis (Wryneck)

Torticollis (Wryneck) is characterized by an abnormal development of the sternomastoid muscle Usually the sternal end is fibrous. Generally the side of the head corresponding to the muscle involved is not fully developed The result of the deformity is that the chin is elevated and the head is tilted to the unaffected side (Fig 188) The muscle involved stands out as a tense cord. This tenseness is emphasized by pulling the chin toward the affected side, and it is more apparent on palpation

Diagnosis—In pronounced cases the condition is obvious, but the milder cases are often mistaken for a habit position because the patient can hold his head in a normal position by a voluntary effort Myositis may imitate the deformity but the history is different. The localized myositis seen soon after birth may suggest a torticollis but palpation will show the characteristic localized nodule.

Treatment—The treatment of torticollis consists of severing the shortened muscle or still better of dissecting out the fibrous

portion of the muscle Subcutaneous section of the muscle is more apt to be followed by recurrence An incision is made parallel to and as long as the fibrous part of the muscle, and the affected part is dissected out. The head must be held in an overcorrected position by means of a plaster cast until healing has taken place The resulting scar is negligible

Gill Cleft Fissures

As a result of failure of obliteration of a gill cleft, a sinus may extend from the skin of the neck to the pharynx. Usually a part of the tract is closed leaving a blind pocket The outer



Fig. 188 —Torticollis, showing tense left sternomastoid, the underdeveloped left side of the face, and the tilting of the chin toward the unaffected side.

opening may be on the side of the neck along the border of the sternomastoid muscle but occasionally it is at or near the mid line in front (Fig 189) In the complete form there is a history of opening since birth, but the external opening may be absent at birth and appear later as a result of the accumulation of fluid material. Usually the sinus ends as a blind pocket.

Diagnosis —The presence of a sinus leading upward and inward toward the root of the tongue is sufficient to establish the diagnosis Before it bursts it may appear as a cyst and being attached to the skin it may be diagnosed as a wen.

Treatment.—Treatment consists of dissection of the entire fistulous tract. In adults this is readily accomplished under

local anesthesia, but in children a general anesthesia is required. One must be prepared to follow the tract the full distance to the tongue If only the terminal portion is removed, there will be a recurrence

Gill Cleft Cysts

When part of a complete sinus has become obliterated, the increase of contents produces a cyst. These occur anywhere along the tract. Usually there is a cyst the size of a walnut or larger below the angle of the jaw (Fig 190) It is fluctuating



Fig. 189.—Gill cleft having its opening in the midline in front.

and on bimanual examination it can be felt to have a close relation to the floor of the mouth.

Diagnosis.—The external topography is very much like that of the large ranulae which bulge the skin of the neck but the ranula is found to be continuous with a bulge lateral to the frenulum When the external end of the canal alone remains patent there is a cyst just beneath the skin of the neck. Since the sinus has an attachment to the skin the cyst has also A cyst situated just beneath the skin and attached to it suggests a wen and there is no way of distinguishing between them unless

one elects to do a diagnostic operation The gill clefts contain a clear or reddish fluid

Treatment.—Whenever one is confronted with such a structure in the area where gill cleft cysts are found, one must approach the removal prepared to follow the tract to the root of the tongue if necessary The procedure is not difficult, but since the deep structures of the neck must be reached it is not an operation to be performed in the office, as a simple wen operation may be.

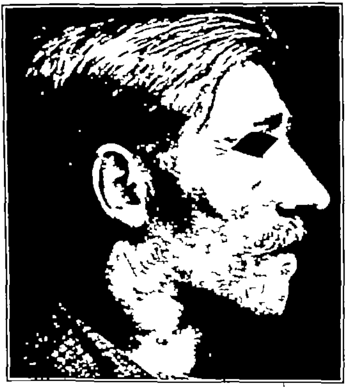


Fig. 190.—Gill cleft cyst.

Thyroglossal Cysts

The primitive location of the thyroglossal duct is from the thyroid gland to the root of the tongue (Fig 191) The duct may go over through or under the body of the hyoid bone Cysts may form anywhere along this duct wherever any part of it escapes obliteration These cysts appear as tense elastic globular tumors, usually as large as a hickory nut (Fig 192), seldom as large as a walnut (Fig 193)

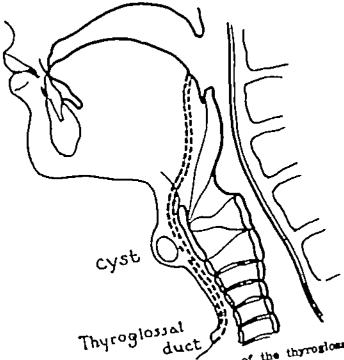


Fig 191 —Schematic representation of the thyroglossal duct.



Fig. 192.—Thyroglossal cyst in a boy of eight.

Diagnosis —The situation in the midline makes their recognition easy Dermoids lipomas and nodules of the thyroid tissue in the isthmus or pyramidal lobe must be considered. Thyroid lobules are more elastic and dermoids are softer, and lipomas

usually have projecting lobules and are flatter. The gill cleft cysts are globular and tense elastic. Finally it is not unusual to make a mistake in diagnosis even after all these factors are considered.

Treatment.—The cyst is cured by dissecting out sac and all. When the whole disease is represented by the cyst its removal is simple enough. One can never be sure however that the cyst represents the whole condition and must be prepared to follow the tract to the root of the tongue. This deep dissection requires a skillful technic.



Fig. 191.—Thyroglossal cyst.

Thyroglossal Fistulas

The thyroglossal duct sometimes is patulous from the suprasternal notch to the root of the tongue. More often only a part of the duct is patulous and the skin terminus is closed and an intermitting sinus results.

Diagnosis.—A probe may be passed along much or all of the distance. Such a tract must be differentiated from a gill cleft fistula. If it is a thyroglossal fistula the probe will follow the midline toward the body of the hyoid bone. If it is a gill cleft fistula it will deviate laterly.

Treatment.—When but a part of the tract is open a simple removal is easy. When the entire tract is open, the procedure is more formidable. The entire tract must be dissected out, a

somewhat redoubtable undertaking, unless the environment and skill of the operator are commensurate

Cartilaginous Nodules

Occasionally in the line of the gill cleft small nodules containing cartilage are found (Fig 194) They are felt as small, round, very hard nodules situated just beneath the skin. Prolongations sometimes extend some distance in depth or they may be associated with other gill cleft anomalies

Diagnosis.—Their density is sufficient to establish the diagnosis. It is not so easy to determine how deeply they extend whether or not there are complicating factors



Fig. 194—Gill cleft cartilage.

Treatment.—Excision is the treatment Because of the uncertainty in diagnosis an operation of some magnitude should be anticipated when they are attacked

Spina Bifida

The posterior cervical region is a common site for hernia of the cord membrane Such hernias are usually of considerable size and may extend up to include the foramen magnum They are soft and elastic and may be covered by a translucent membrane (Fig 195)

Diagnosis.—Their recognition is easy. When they are small and covered by normal skin difficulty may arise. Their position exactly in the midline and their existence since birth are diagnostic.

Treatment.—Removal is a task for the neural surgeon. Generally speaking they are proper objects for surgical attack when the skin over them is intact and when there is no paralysis of the extremities. If the covering is made up of a thin parchment-like membrane or there is a paralysis of the extremities, or both, the case is hardly a proper one for any operative procedure.

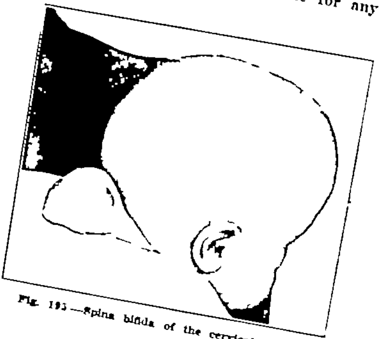


Fig. 195.—Spina bifida of the cervical region.

Lymph Cysts

Congenitally dilated lymph vessels are seen more often in the neck than in any other region. They are noticed soon after birth and appear as soft, boggy masses spread out over the neck as though the hand were laid on it (Fig. 196). They are not always recognized at birth but soon become apparent as soft flattened masses. They develop slowly and cause no inconvenience. Occasionally they undergo violent reaction and become swollen, hard and painful. This reaction subsides after a period of weeks and may result in a partial obliteration of the cyst. They are

soft but do not disappear on pressure and the skin covering them is normal. Sometimes the whole side of the neck is in volved and there may be prolongations into the axilla.

Diagnosis—Their congenital origin and soft feel make the diagnosis. The skin over them is normal and they are not com pressible, *this differentiates them from the hemangiomas.*

Treatment.—They may be much reduced by the x ray but a complete cure requires an extensive dissection for they extend deeply and may surround the deep vessels of the neck. Opera tion should be delayed until the child is three or four years old *Inflammatory reaction should be treated expectantly* as with ice packs, lead acetate solution, and the like



Fig 194.—Lymph cyst of the submaxillary region.

Hemangiomas

Superficial angiomas may involve the skin of the neck either as fairly circumscribed lesions or as diffuse patches extending down from similar lesions of the face Deep cavernous angio mas extend deeply in the neck. They appear as large soft, com pressible tumors covered by normal skin

Diagnosis.—Their compressibility differentiates them from lymphangiomas

Treatment.—The superficial type may be treated as described for like lesions of the face The cavernous variety are cured only by ligating them at their source which constitutes a procedure *of some magnitude*

Dermoids

Simple dermoids are found in the anterior midline and in the region of the mastoid process. They form soft, elastic tumors often attached to the underlying tissue They are globular tumors unattached to the skin

Diagnosis.—They are mistaken for thyroglossal or thyroid cysts, but are less tense than thyroglossal cysts when situated in the midline The mistake is not important if the operator is prepared to complete the task should the thyroglossal tract be involved.

Treatment.—Their complete removal is demanded. They may extend to the floor of the mouth, this complicates the operation.

THE INFLAMMATORY AFFECTIONS OF THE NECK

The cervical lymph glands being exposed to infections from the oral and nasal cavities, are frequently the site of reactive processes. The reaction in the lymph glands usually corresponds to the severity of the process in the primary focus In severe infections the capsule of the gland may perforate early and produce a diffuse cellular suppuration of the neck Direct transmission from the floor of the mouth may produce a diffuse inflammation. The site and rate of development of the inflammation therefore may indicate a fairly accurate presumptive diagnosis of the kind and origin of the infection.

Topography of the Lymph Glands

A knowledge of the lymph drainage is necessary to determine the origin of the infection when a lymph node is involved.

Superficial Lymphatics (Fig 197)—The parotid lymphatics drain the region of the temple and the outer half of the eyelids The glands below the mastoid drain the occipital posterior parietal and mastoid regions The submaxillary glands drain the buccal area The superficial glands in the posterior cervical region may be affected secondarily from any of these regions.

The deep cervical glands, located beneath the angle of the jaw receive drainage from the postpharyngeal (Fig 198) and the internal maxillary regions. The deep cervical glands in the di

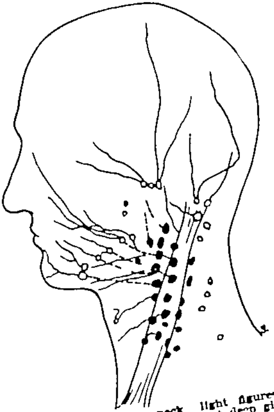


Fig. 197.—Lymph drainage of the neck, light figures represent superficial glands, dark figures represent deep glands.

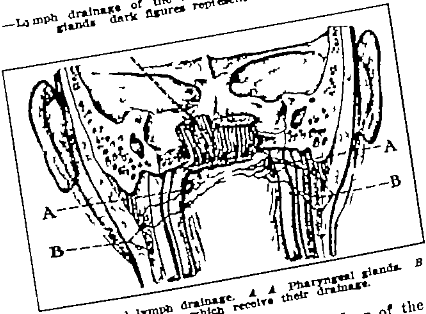


Fig 198.—Pharyngeal lymph drainage. A A Pharyngeal glands. B B Cervical glands which receive their drainage.

gastric triangles receive drainage from the floor of the mouth. Those near the cornu of the hyoid bone receive drainage from the larynx

The acutely enlarged glands are usually due to some acute infection of the region which they drain The chronically enlarged glands are dependent on either some chronic infection or on a primary or a secondary neoplasm

Acute Inflammation of the Lymph Glands

Pain and tenderness increased on movement is the first symptom of acute lymphadenitis. The patient may not be aware of the primary affection. One or many glands may be involved There may be edema of the surrounding tissue The gland may regress, leaving no trace or it may remain enlarged for an indefinite period or it may suppurate and involve the surrounding tissue even extending to the mediastinum

Diagnosis—When the glands are palpable and tender and if the surrounding tissues are in a state of reaction, one may be reasonably sure that he has to do with acutely inflamed glands When there is but a single enlarged gland one must consider other possible causes Suppurating gill clefts cysts, dermoids or even wens and the like must be kept in mind. When there is diffuse inflammation obscuring the outlines of the individual glands one must determine whether or not one has to do with a periadenitis or a diffuse infection. The differentiation is never absolute Usually the infection becomes diffuse by having destroyed or perforated a gland. The important factor then is to determine the presence of pus. If present it must be drained

The area which the group drains must be explored for the primary infection before the diagnosis of an acute secondary adenitis is substantiated. In the postcervical gland involvement a focus must be sought in the occipital region. The upper cervical triangles point to a focus about the ear and nasopharynx. In the submaxillary group an affection of the oral cavity may be suspected. Of these the tonsils are preeminent So constant is this that the involvement of these lymph glands may be regarded as a part of the disease process Infections of the floor of the mouth, the tongue the lips the pharynx, and the cutaneous surfaces also cause involvement of these glands The glands of the anterior maxillary triangle and the submental glands are also involved in infections of the floor of the mouth and the lips

but they are also involved by extension of the infection from the glands situated farther back.

The diagnosis is not complete until a cause to correlate with the effect is found If there is no primary lesion present, there may be a history of there having been one For instance a tonsillar infection may subside but the gland enlargement persist. The state of the acutely inflamed gland presents another phase of the diagnosis If the glands are discrete and fairly freely movable one may be reasonably sure that the infection is being combated If the glands cannot be outlined and the whole area is more or less matted indurated, brawny edematous suppuration and periglandular infection are probably pending and if fluctuation can be demonstrated one may be sure of such a diagnosis. It is only occasionally that fluctuation of the individual gland can be demonstrated In these cases the infection is usually of low virulence and the history records a slow development. A solitary lesion presenting fluctuation is very apt to be something else than a suppurating lymph gland. (Fig 200) Deep abscess in the supraclavicular fossa may point in the same region and seem to be superficial when they are not (Fig 201)



Fig. 199—Discrete adenitis.

Very often a glance at the patient may give one a clue as to the stage of the process If the undermined glands can be outlined through the skin (Fig 199) the glands likely have not yet



Fig 260 —Superficial abscess of the neck.



Fig. 261 —Deep abscess of supraclavicular fossa.

broken down If on the other hand the swelling is diffuse (Fig 202) there likely is a periglandular abscess When the deep glands are the site of infection it develops lower down and lifts up the sternomastoid muscle (Fig 203)

Treatment —When the glands are discrete and movable treatment of the primary cause may permit resolution without further



Fig 202—Periglandular abscess formation in the superficial cervical lymph glands.

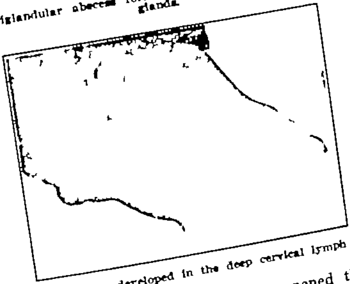


Fig 203—Abscess developed in the deep cervical lymph glands.

complication If a primary abscess can be opened the causative factor may be removed Abscess in the occipital region or in the floor of the mouth or a peritonsillar abscess etc, is amenable to this treatment In addition measures may be used to lessen the tendency to suppuration within the glands Early in the process cold applications are useful These not only make the

patient more comfortable, but may aid in preventing an extension of the infection. Once suppuration has taken place cold does no good and may increase the pain Hot applications are more agreeable and also hasten the process of abscess formation. The site of the maximum infection becomes more apparent and this serves the timid operator as a guide for his incision. Generally speaking however when the time for the hot poultice has arrived the time for incision also has arrived. Fluctuation cannot be awaited The induration the brawny feel is sufficient indication for drainage The smallest incision which will serve is desirable because the scarring will be less An incision must be made through the skin superficial fascia and platysma A closed forceps may be used to penetrate the abscess. As the pus wells out the blades are spread and withdrawn. A gauze wick is used in dressing A local anesthesia can usually be employed except in children When the area involved is extensive general anesthesia a wide incision and exploration by the finger is the method of choice

CHRONIC LYMPHADENITIS

Chronically enlarged lymph nodes are one of the most common affections of childhood The common causes are residual pyogenic infections from the oral cavity or tuberculosis

Chronic Pyogenic Lymphadenitis

When acute infections subside the glands are slow to regain their normal state There results enlarged glands varying in size from a pea to a hazelnut In chronic infections in the oral cavity most commonly the tonsils or teeth the glands slowly become enlarged are usually somewhat matted to their capsules but manifest little sensitiveness to pressure and are without notable constitutional symptoms

Diagnosis.—The history of previous acute lymphadenitis is suggestive as is the presence of obvious sources of chronic infections. The common source of error is tuberculosis. This infection may be associated with acute infections or it may be the cause of the chronic form. The history of acute infection would tend to exclude tuberculosis Tuberculous glands are attached more to the surrounding connective tissue than other varieties.

Often a differentiation is aided by considering the general physical state of the patient

Treatment.—Attention to the general health of the patient and removal of the cause, if any, particularly adenoids and tonsils, should be given Fresh air and syrup iodide of iron are the chief aids

Tuberculous Lymphadenitis

Enlargement of the cervical lymph glands due to tuberculous infection the scrofula of our forefathers, is one of the most common of the ailments of the neck in children The patients

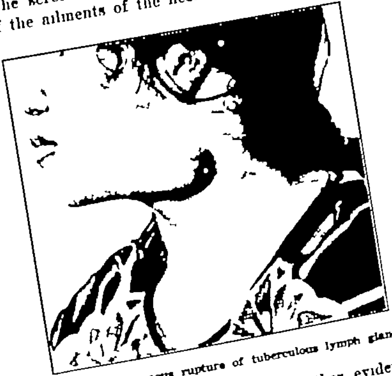


Fig. 204—Spontaneous rupture of tuberculous lymph glands.

are usually undernourished and present other evidence of ill health The tonsils are usually enlarged and there is often a history of repeated attacks of acute tonsillitis. The superficial cervical glands are usually involved often extending to the midline in front and extending to the deep glands in the neck. Usually they are bilateral They are of slow development and present a periadenitis with a general matting of the glands. Later on they soften and may perforate the skin spontaneously and remain as discharging sinuses or ulcers with undermined soft, bluish borders (Fig 204)

Diagnosis.—The chronicity, the wide distribution and the tendency to matting serve in a measure to separate them from the chronic pyogenic infections. The general physical state and a tuberculous heredity help some, but it is only the softening and the establishment of a fistula that make the diagnosis certain. Sometimes tuberculous glands grow rapidly and form large, smooth elastic glands with little tendency to mat These may be mistaken for Hodgkin's disease Tuberculosis involves most commonly the submaxillary and subclavicular glands while Hodgkin s disease involves most frequently the posterior cervical and less commonly the deep cervical glands Finally the microscope may aid, but even with this the differentiation may be uncertain

Treatment.—It was formerly the practice to dissect out the glands involved. This plan had several objections sometimes the patient died of a generalized miliary tuberculosis. Sometimes other glands become enlarged even after a complete block dissection and finally it has been found that if the source of infection is removed and the patient placed under good hygienic conditions operation is not necessary The glands disappear without scar and without the danger of the infection spreading after operation

PRIMARY TUMORS

Theoretically primary tumors of the lymph glands may be separated into the true Hodgkin s disease and the lymphosarcomas. The primary epitheliomas of the lymph glands are a rare type of tumor that may be left to the pathologist to worry about The two divisions of lymphomas above noted are not clearly separated but for purposes of clinical understanding the attempt must be made.

Hodgkin s Disease

The typical Hodgkin s disease begins with the enlargement of a number of glands most frequently the postcervical. They are smooth and elastic and seem to glide about in the tissues under the examining finger It is apt to be unilateral though sooner or later both sides become affected followed often by involvement of other gland groups notably in the axilla groin, mediastinum and retroperitoneum. Within a few months they become of considerable size as large as a pigeon s egg or a small orange (Fig 205)

Diagnosis—The essential point in differentiation is the tendency of the glands to remain independent of each other. Rarely do tuberculous glands remain so separated but occasionally they do. In such instances the breaking down of the interior discloses the tuberculous nature.

Treatment—It was formerly the practice to remove these glands by block dissection of the neck. X ray treatment gives



Fig 20 —Hodgkin's disease in a boy aged fourteen.

as long freedom from recurrence as operation and is more pleasant to the patient. It is to be remembered that exact differentiation between this disease and tuberculosis may not be obtained, and enthusiasts may think they have cured a true Hodgkin's disease.

Lymphosarcomas

Primary lymphosarcomas develop as a solitary tumor usually below the angle of the jaw (Fig 206) or just behind the insertion of the muscle (Fig 207). They soon attain the size of an apple. They move with their environment but are not encap-

sulated. As one grows it approaches the skin which becomes reddened over the summit, giving it the appearance of the skin covering a spina bifida The tumor is soft elastic and pseudo-fluctuating Later on these tumors may invade the pseudocapsule and spread to the surrounding tissue or other glands may become involved and the case terminate as a typical Hodgkin s disease.

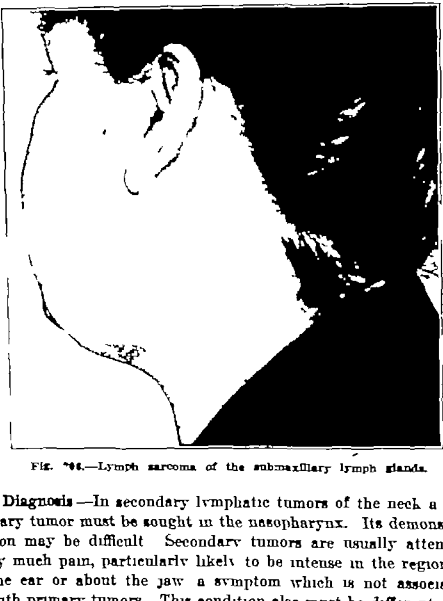


Fig. [illegible].—Lymph sarcoma of the submaxillary lymph glands.

Diagnosis—In secondary lymphatic tumors of the neck a primary tumor must be sought in the nasopharynx. Its demonstration may be difficult Secondary tumors are usually attended by much pain, particularly likely to be intense in the region of the ear or about the jaw a symptom which is not associated with primary tumors. This condition also must be differentiated from Hodgkin s disease Lymphosarcoma is a solitary tumor, while Hodgkin s disease even when large shows lobulations

When the tumor becomes pseudofluctuating it must be distinguished from an abscess. The history of slow noninflammatory development is sufficient to distinguish sarcoma from abscess. If there is any doubt aspiration may be employed.

Treatment.—The x ray usually causes partial or complete disappearance. Operation is worse than useless. To mistake them for an abscess is a disaster because the wound will continue to discharge blood and the whole tumor to fungate.

Metastatic Tumors of the Lymph Glands

Whenever a lymphatic tumor of the neck is encountered search should be made for a possible primary tumor within the



Fig. 207.—Primary sarcoma of the lymph glands.

drainage area. The more common of such tumors are the melanotic tumors of the scalp and the epithelial tumors of the mouth, tongue and lips. I have repeatedly seen large tumors of the neck of which the small parent tumor within the mouth was entirely overlooked. Metastatic tumors are small, seldom larger than a hickory nut, and are densely hard. They are more or less fixed and are not tender to touch. This feel is usually pathognomonic in the epithelial metastases.

Diagnosis.—An inflammatory lymph gland will subside or suppurate within a few weeks. It is smooth and elastic rather

than hard and may be sensitive to touch The shot like hardness of the carcinomatous metastasis in the lymph glands is not encountered in inflammatory glands.

Treatment.—When the glands are discrete and the periglandular tissue not in reaction metastatic lymph nodes should be dissected out. A cure rarely results but prolonged freedom may be obtained The x ray may cause temporary regression

CELLULITIS

In contradistinction to infections confined to the glands are the infections which play their rôle in the loose cellular tissues of the neck Among these may be mentioned diffuse cellulitis Ludwig s angina woody phlegmon, and actinomycosis.

Diffuse Cellulitis

The acute diffuse inflammations of the neck may be derived from direct extension from infection of the floor of the mouth or from a tooth or from the rupture of an infected lymph gland. In either event the loose cellular tissue becomes infiltrated with an extensive exudate It is attended by fever and more or less pain The process may become promptly localized or the inflammation may spread downward toward the mediastinum or inward toward the esophagus and trachea. In the former i i tance inaccessible regions may become involved and in the latter dysphagia or edema of the glottis may develop Pus may be indicated by a high leucocytosis or a brown bluish discoloration of the skin. Fluctuation is a late sign.

Ludwig s Angina

Ludwig s angina is a type of diffuse inflammation characterized by rapid extension in the submaxillary connective tissue. The swelling is firm to the touch and extends entirely across the neck and in severe cases may so swell the anterior region of the neck that chin to sternum represents a straight line There is profound constitutional disturbance and little tendency to abscess formation. Edema and compression of the trachea hinder breathing Many cases go on to fatal termination because of the disturbance of respiration or from general sepsis.

Diagnosis.—The other phlegmonous processes in this region are not of such rapid development and the constitutional symptoms are less marked. Woody phlegmon and actinomycosis are both slow of development. Carcinomas may cause an intense infiltration but the primary tumor is much in evidence.

Treatment.—The area infected must be incised early and widely. An incision is usually required from one angle of the jaw to the other and deep enough to expose the digastric muscles. The area of abscess formation may be small and difficult to localize.

Woody Phlegmon

Woody phlegmon is a type of diffuse infiltration of slow development and of very hard consistence, hence its name. After a duration of many months it tends to resolve without the formation of an abscess.

Diagnosis.—The slight constitutional symptoms distinguish it from Ludwig's angina and the absence of points of suppuration distinguish it from actinomycosis.

Treatment.—Incision is not required. Hot applications lessen the pain and may hasten resolution. Some operators attempt to hasten resolution by dissecting out the indurated tissue.

Actinomycosis

The submaxillary connective tissue may become indurated from an infection by the ray fungus. Usually it is unilateral and tends sooner or later to break down into small abscesses and to perforate the skin with the escape of a dirty gray pus with flocculi. These abscess openings form a puckered scar with a small elevated crater.

Diagnosis.—The puckered scars are characteristic (Figs. 63 and 113). Occasionally rapidly growing carcinomas break through the skin discharging a thin secretion which resembles the pus in actinomycosis (Fig. 208). The demonstration of the ray fungus is of course conclusive.

Potassium iodide taken internally and iodide solution injected into the tissues constitute the treatment. Perhaps the x-ray is of use.

Boils

The neck (particularly the nape) is a favorite seat of boils. Nearly always the patient comes with the correct diagnosis. Often there is evidence of former boils (Fig 209) Sometimes a granuloma develops at the site of an old boil and may persist for many months.

Diagnosis—Occasionally an inflamed wen or dermoid or a thyroglossal cyst is mistaken by the patient for a boil None of these has such a diffuse halo of redness and the elevation is globular instead of pyramidal as is a boil



Fig. 08.—Metastasis in the submaxillary lymph glands which has perforated the skin, thus simulating an actinomycosis.

Treatment.—Immediate treatment consists of hastening the breaking down of the center and evacuating the pus and, secondarily prevention of other boils

Fomentations and incision constitute the common practice but a simple and efficient treatment is the application of a salicylic acid plaster of 10 to 20 grains in an ounce of vaseline By keeping this over the developing boil the skin is macerated and soon opens. The aseptic property of the acid does much to prevent the formation of new boils. When chronic granulomas

develop (Fig 210), these must be curetted out and the cavity disinfected with iodine

Deterioration of the general health must be corrected by appropriate means Such patients often improve in general health from the administration of 30 minims of syrup iodide of iron when nothing can be found wrong by physical examination

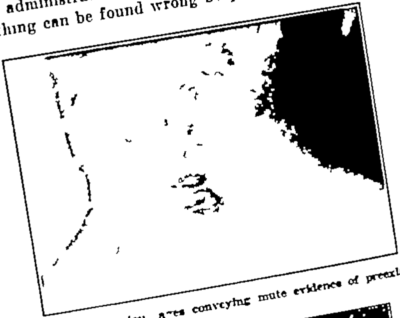


Fig 209 —Scars of various areas conveying mute evidence of preexisting boils

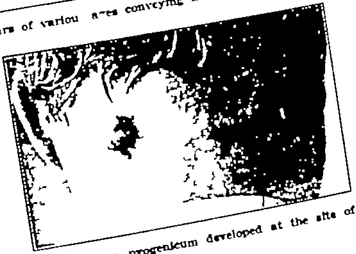


Fig 210 —Granuloma pyogenicum developed at the site of a boil.

Carbuncle

Carbuncles are formed by a number of foci of infection, each focus being the equivalent to a boil. The back of the neck is the most common site for this affection The large number of skin follicles in this region and the constant pressure by the collar which tends to spread infection are responsible for the frequency

in this region Women nowadays do not have carbuncle of the neck. The spread of the induration is large, even to two or three inches in diameter There is pronounced constitutional disturbance. The skin is thickened and indurated and of a livid blue color It is spontaneously painful and tender Carbuncles are particularly apt to complicate diabetes and other states of impaired health

Diagnosis—The condition can only be mistaken for its milder prototype the boil Sometimes in the beginning one cannot be sure whether a boil or a carbuncle is in process of development, but time soon clears up the difficulty

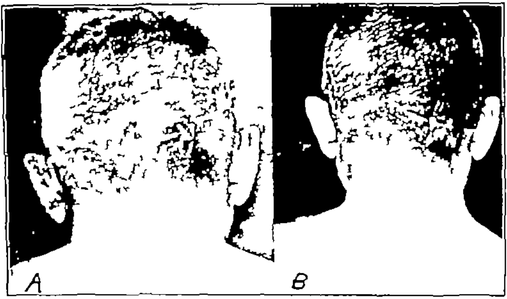


FIG. 211.—Carbuncle on the back of the neck. *A* Lesion at the height of inflammation. *B* Cross-incision after the pack has been removed.

Treatment—Discharge of the pus may be invited by a salicylic plaster as in case of the boil, but owing to the thickness of the skin, this is uncertain and slow Hot packs and early incision are indicated Cross incisions with elevation of the flaps and a loose packing with gauze is the most satisfactory treatment (Fig 211) Occasionally the constitutional effect is marked and death from general sepsis may take place

TUMORS

If affections of the lymph glands can be recognized the group of true tumors is relatively small yet in the aggregate they are numerous and important.

Solid Tumors

Solid tumors of the neck not derived from the lymph glands may be new formations of parenchymatous organs or an aberrant one The skin tumors show the same characteristics as skin tumors elsewhere



Fig. 212.—Crateriform epithelioma of the neck.



Fig. 213 —Papillary epithelioma of the neck

Epitheliomas of the Skin

The upper part of the neck is frequently the habitat of peculiar crater like spindle-celled carcinomas The border is elevated and firm and presents the peculiar character of an epithelioma.

They are confined entirely to the skin and move with it freely over the superficial fascia This fact differentiates them from *more deeply seated tumors which reach the skin secondarily* They vary somewhat in degree of elevation The flat ones (Fig 212) are less malignant than the more elevated ones (Fig 213) *They grow slowly and do not tend to form metastasis.* Carcinomas not infrequently develop in scars in this region They are superficial (Fig 214) and grow but slowly The dense *border is characteristic Often the small pinpoint cancer nests* can be seen with the naked eye When removed with a wide margin cure may be expected When treated by x ray they *heal but tend to return They should therefore always be* treated by excision



Fig. 14 —Carcinoma developing in an old scar from a burn.

Muscle Tumors

Muscle tumors of the neck are confined chiefly to the small tumors of the sternomastoid seen soon after birth and gummas of this muscle Secondary lymphosarcoma nodules may be formed in the muscles but the relation to the primary tumor is *not hard to establish. In infants* usually about a month old nodules as large as a hickory nut are sometimes seen about the middle of the sternomastoid muscle They seem sharply defined and are *freely* movable laterally *less so* in a vertical direction. They are smooth and hard and seem to cause the little patient no concern They are due to myositis following birth trauma. In chronic syphilitics a *gummatous nodule may be found* in the

muscle, but is not likely to break down They disappear in the progress of the treatment of syphilis In a number of instances in patients who had had a lobectomy of the thyroid gland, I have seen a nodule of thyroid tissue develop on the surface of the sternomastoid muscle (Fig 215)

Diagnosis—Nodules seen in infants are obviously myositis, while those seen in adults are almost equally certainly syphilitic. Nodules found in the muscles following goiter operations are quite certain to be transplanted thyroid tissue.

Treatment.—The myositis as seen in babies disappears of its own accord A little mercurial ointment is said to hasten the resolution The thyroid nodules may be removed if the cosmetic disturbance annoys the patient



Fig. 215—Secondary nodule of thyroid tissue following lobectomy

Mixed Tumors of the Salivary Glands

Mixed tumors growing from the part of the parotid and submaxillary or sublinguals gland appear as solid slowly growing tumors of the parotid region or submaxillary triangle

Diagnosis—The very slow growth is the chief characteristic. They are less often nodular here than in the upper parts of the parotid Many however show the typical firm bossilations characteristic of the mixed tumors Simple chronic inflammation of the submaxillary gland may simulate a mixed tumor The development is more rapid

Treatment.—Resection results in a cure



Fig 216.—Lipoma in the submaxillary triangle.



Fig. 217.—Carotid tumor

Lipomas

Lipomas appear as hemispherical masses anywhere on the neck (Fig 216) They are usually situated just beneath the *skin, less often* under the platysma muscle They have the usual characteristics of lipomas Those lying deep may send interdigitations between the underlying muscle, and some care must be exercised in their removal

Diagnosis.—Lipomas must be differentiated from cysts in this region—lymph cysts, dermoids, wens, gill cleft, thyroid, etc.

Treatment.—They are readily shelled out under local anesthesia

Carotid Tumors

Tumorous enlargements of the carotid gland are situated just in the carotid bifurcation (Fig 217) They develop slowly, are hard, and occasionally bosselated They may be freely movable laterally but little vertically, no more than the elasticity of the carotid allows

Diagnosis—Their situation exactly over the carotid bifurcation and the slow growth is suggestive. *Often the diagnosis is* completed during the course of operation.

Treatment.—Removal results in a cure usually, but it is a formidable operation

Aberrant Goiter

Aberrant goiters are sometimes found in the upper *triangle* of the neck *Occasionally they enlarge and subside* with the fluctuation in size of the goiter normally situated, thus suggesting the diagnosis. It is easy to misjudge this sign. When the aberrant goiter is toxic pulsations may be felt but this may be misjudged for secondary movements *of a carotid tumor*

Diagnosis—Usually the diagnosis is not definite until the operation is well under way

Treatment—Removal is the treatment

CHAPTER X

DISEASES OF THE CHEST

Under the heading of diseases of the chest as a matter of topographic convenience may be included the diseases of the soft parts of the chest the mammary gland, the chest wall and a few of the commoner intrathoracic affections belonging within the realm of minor surgery

DISEASES OF THE SOFT PARTS

The affections of the skin and muscles offer but little variation from like affections occurring in other parts Melanotic tumors and syphilitic affections require especial note

Papillomas

The skin of the chest harbors soft pedunculated warts of little consequence The fibrous papillomas are distinctly pedunculated and soft The multiple melanomas are usually flat and present a variety of degrees of pigmentation The solitary melanomas present a varying degree of pigmentation from light brown to intense black. These latter not infrequently develop as the result of some irritation or contusion and give rise to melanotic metastasis Tying a string about the base of a wart to cause it to necrose is a common practice and frequently causes a malignant change to follow Destroying them with paste or incomplete cauterization, likewise is calculated to excite malignancy The tendency to malignancy does not bear a direct relation to the degree of pigmentation they exhibit Usually when malignant changes occur they show some increase in size and often the surrounding skin is hyperemic Malignancy however may take place when there is little change in the local growth (Fig 218)

Diagnosis—The pedunculated warts are soft pigment free being whitish in color Some of these have a yellowish tinge which declares them related to the pigmented warts. The mel

anotic papillomas are less soft and usually have a broader base. When the skin about them is unchanged they may be supposed to be innocent The neighboring lymph nodes, however, should always be inspected When the skin about the base is indurated the innocent stage has passed even if no metastasis is demonstrable Conversely, if axillary or supraclavicular adenopathy

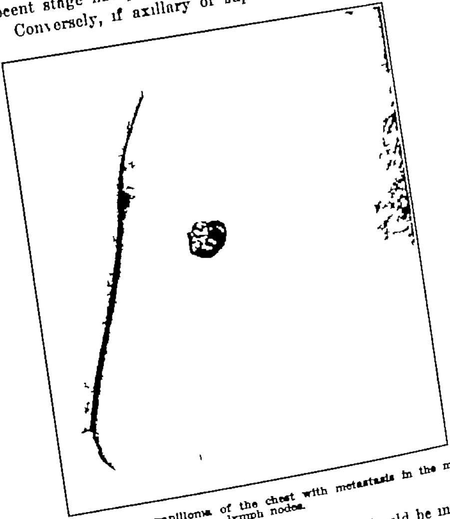


Fig. 218 —Melanotic papilloma of the chest with metastasis in the maxillary lymph nodes.

is discovered the neighboring drainage area should be inspected for the possible existence of the melanotic papillomas.

Treatment.—Yellow pedunculated warts and solitary melanomas should be removed as a prophylactic measure. Excision a quarter of an inch from the base is the best practice The cautery should not be used unless a wide excision is done. Multiple papillomas do not require removal Once the skin about the base has become infiltrated a much wider incision is required

than when the skin is not affected Once the lymph glands are involved any sort of treatment is without avail

Carcinomas

Not infrequently flat epitheliomas develop over the upper part of the chest, usually just below the clavicle They are of slow growth often developing for years before they attain notable size and are but little prone to form metastasis the ulcerations remain superficial Sometimes they show a tendency to heal about the periphery

Diagnosis.—They resemble tuberculous lesions somewhat particularly when they show a tendency in some areas to spontaneous recovery The borders are firmer however than in tuberculosis and never have the overhanging edges characteristic of tuberculosis.

Treatment.—Wide excision should be practiced followed by skin grafting They sometimes do well under x ray treatment.

Syphilis

The upper part of the chest sometimes shows gummatous ulcerations. They are often associated with syphilitic periostitis of the clavicle The ulcerations are typical of syphilis, being reniform ulcers developing within a month or two and if there are several lesions the grouping is reniform (Fig 219)

Diagnosis.—They are deeper than tuberculosis, have the typical kidney form and grouping of syphilis and they develop more quickly than tuberculosis

Treatment.—The usual treatment of syphilis must be instituted. Covering them with mercurial ointment which is held in place by adhesive strips placed shingle fashion, causes them to disappear quickly The usual treatment for the cure of syphilis must follow

Tuberculosis

Tuberculosis of the skin of the chest begins as a superficial bluish elevation which breaks down in the center forming an irregular ulcer with soft overhanging edges. They develop very slowly and are painless.

Diagnosis —They are softer than epitheliomas, less regular in outline than syphilis and develop much more slowly

Treatment.—Their destruction by the electrocautery is permanent Excision is less certain. Injection of 5 per cent iodoform glycerin about them causes them to heal after a period of months. The injection must be repeated several times



Fig 19 —Gummas of the frontal and the clavicular regions

Rare Tumors

Lipomas and wens are sometimes found on the chest. Angiomas capillary and arteriovenous are sometimes found in this region They may be managed as like lesions elsewhere Globular sarcomas encapsulated with reddened surface are sometimes observed in the region of the clavicle (see section on Bald Headed Sarcomas Chapter on Diseases of the Abdomen) Dermoids are sometimes found in the pectoral muscles.

DISEASES OF THE STERNUM AND RIBS

When confronted by tumors of the sternum and ribs one thinks of syphilis tuberculosis typhoid fever osteomyelitis, pus microbe osteomyelitis, rarely of sarcomas

Syphilis

Periostitis of the sternum and clavicle are among the com moner diseases of the thoracic wall, but the ribs are seldom af fected The characteristic symptoms are pain, especially at night, a fusiform swelling firm, elastic to the touch, slightly tender and of relatively rapid development The sternal involve ment is the most common and is particularly characteristic. It appears as a low, hard swelling the edges of which disappear into the surrounding tissues without any recognizable margin

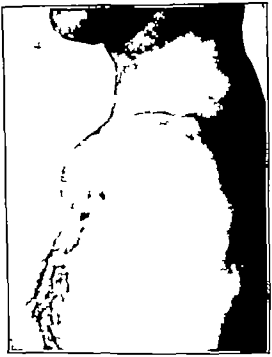


Fig 220.—Gumma of the sternum showing the characteristic ovoid elevation.

(Fig 220) If untreated, they tend to ulcerate (Fig 221) producing typical reniform ulcers. The rib gummas give similar symptoms, but the lesion is less easily palpable (Fig 222) The clavicle likewise is commonly affected and results in a fusiform swelling usually at the midportion.

Diagnosis—Periosteal syphilis is usually mistaken for a sar coma. Sarcoma does not spring up within a month or two as does syphilis and the tumor is more sharply defined neither is there the pain common to syphilis. Sarcoma of the sternum is

very rare Sarcoma of the ribs and clavicle, on the other hand is more common than syphilis, but the tumor is more sharply defined Finally the therapeutic test remains as the final and

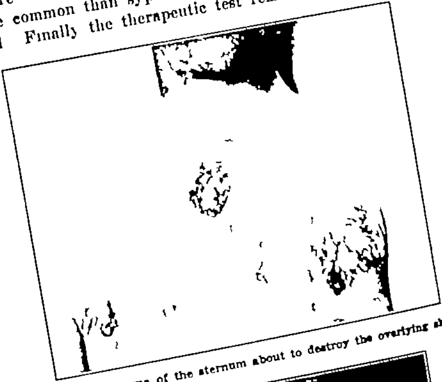


Fig 221—Gumma of the sternum about to destroy the overlying skin.

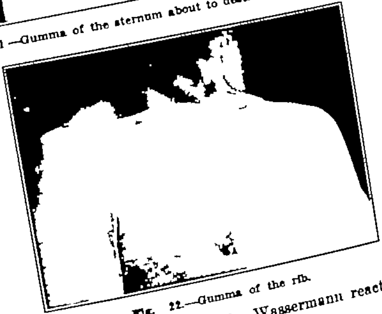


Fig. 222—Gumma of the rib.

most reliable diagnostic test The Wassermann reaction is unreliable in these affections

Treatment.—Mercurial ointment locally and potassium iodide internally causes a rapid disappearance of the symptoms. Salvarsan likewise is effective but less agreeable to the patient

Tuberculosis

The sternum is rarely affected by tuberculosis but tuberculous affections of the clavicular joints and the ribs are by no means uncommon Their chief clinical characteristic is the chronicity In the sternoclavicular joints the lesion requires many months before the patient seeks advice There is gradual swelling of the joint (Fig 223) and moderate pain. The rib affection begins as a spindleform swelling covered by normal skin and is a little

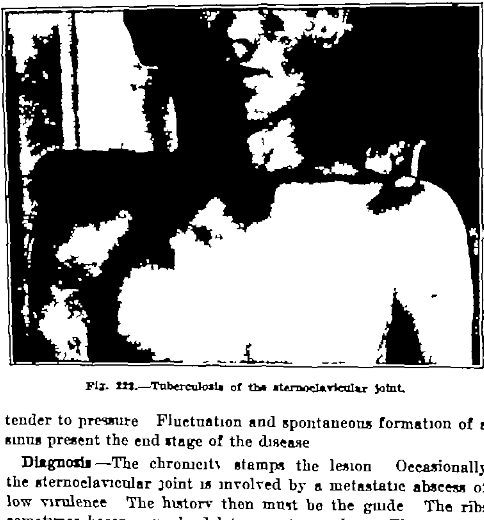


Fig. 223.—Tuberculosis of the sternoclavicular joint.

tender to pressure Fluctuation and spontaneous formation of a sinus present the end stage of the disease

Diagnosis.—The chronicity stamps the lesion Occasionally the sternoclavicular joint is involved by a metastatic abscess of low virulence The history then must be the guide The ribs sometimes become involved late in osteomyelitis. The presence of osteomyelitis elsewhere aids in the diagnosis In many instances, both of the joints and of the ribs, the exact causative factor cannot be determined with certainty

Treatment.—Resection of the joint and of the affected portions of the ribs is the proper treatment. Sufficient tissue must be removed so that healthy bone is reached. This is particularly true of the rib. Even then healing is sometimes long deferred. Iodoform glycerin injections are successful if persevered in.

Infections in Typhoid Fever

The ribs are not infrequently involved following typhoid fever. The disorder begins usually within a few months after recovery from typhoid fever. The affected area is spindleform, tender to pressure and the skin is usually reddened.

Diagnosis.—The early reddening of the skin and the appearance after a siege of typhoid fever are diagnostic. The other causes previously mentioned must be kept in mind. Typhoid bacilli may be identified.

Treatment.—Usually expectant treatment suffices. Attention to the general health constituted the most important measure. If a sinus forms, the use of typhoid vaccine sometimes is followed by a cure. If this fails, a portion of the rib may require section.

Osteomyelitis

Primary osteomyelitis of the ribs, sternum or clavicle is ushered in by constitutional disturbance often ascribed to other causes. The rib affection may be overlooked until an abscess forms. When the infection is secondary to an osteomyelitis elsewhere, the onset is less stormy and is often overlooked.

Diagnosis.—The acute onset is characteristic, likewise the involvement of a rib when there is osteomyelitis elsewhere. When there is an accompanying rash, scarlet fever is likely to be diagnosed and when the abscess is discovered late, this is said to be secondary to the scarlet fever. Occasionally an empyema partly perforates the thoracic wall and may be mistaken for a rib affection. The physical signs of empyema should be sufficient to prevent such confusion.

Treatment.—The abscess should be drained as soon as it is discovered. It is only rarely that the rib becomes necrotic. It is best to await spontaneous loosening of the dead bone when this does occur. Premature efforts at removal may result in a per

foration of the parietal pleura with serious infection of the pleural cavity The chest cavity must be as carefully protected against infection as the peritoneal cavity would be under like conditions and surroundings

INJURIES OF THE CHEST

Contusions of the chest fractures of the ribs and penetrating wounds of the chest wall are the common conditions.

Contusions of the Chest Wall

Blunt objects striking the chest may cause injuries to the soft parts which may produce subcutaneous hemorrhages and less often a myositis. The injured region is indurated and often swollen and tender to the touch. The lesion usually quickly heals though the myositis may persist for a number of weeks.

Diagnosis.—Fracture of ribs must be excluded which is possible by the fact that in contusion tenderness is confined to the region injured. There is no evidence of intrathoracic injury

Treatment—If recent ice bags give relief The application of some mild counterirritant hastens resolution.

Fracture of the Ribs

Injuries of the chest frequently are complicated by fracture of the ribs. This may result from a direct blow or indirectly by compression of the thorax. The injury may be limited to fracture of the rib or a fragment may perforate the pleura and injure the lung In simple fracture there is local pain on pressure or pain on movement of the chest, but without notable pain on quiet respiration. If the lung is injured there may be an escape of blood into the pleural cavity or air may escape and become diffused into the soft tissues of the chest producing an emphysema

Diagnosis—Simple fracture may be distinguished from contusion by making pressure over the injured rib some distance from the site of injury If pain is caused, there is a fracture Sometimes crepitation may be elicited. The x ray gives positive evidence The escape of blood into the pleural space is marked

by flatness on percussion and emphysema is easily recognized by the peculiar crackling on palpation

Treatment.—Simple fracture is treated by strapping The chest is compressed as much as possible by exhalation and then an adhesive strip is applied long enough to extend a few inches beyond the midline before and behind The first strip should extend with its lower margin about the level of the tip of the ninth rib several more strips are then added to overlap shingle-

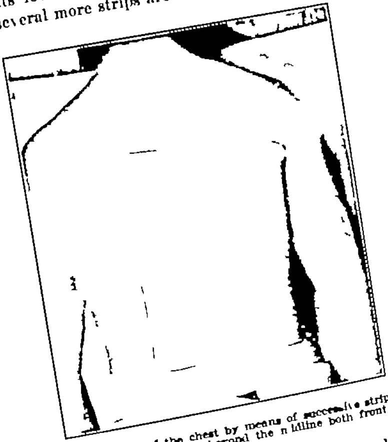


Fig 224 —Immobilization of the chest by means of successive strips of adhesive plaster Note the strips extend beyond the midline both front and back.

like the upper border of the strip first applied Each additional strip should be applied with the chest in the position of extreme exhalation The strips should pass the midline before and behind it (Fig 224) Hemorrhage is usually soon absorbed Emphysema in the tissues likewise is soon absorbed When there is a continuous entrance of air into the pleural cavity the accumulated air may so displace the mediastinum that the other lung is compressed to such a degree that the patient is threatened by asphyxiation In such cases the air must be aspirated to lessen

the intrathoracic pressure Any sort of aspirating apparatus may be used.

Penetrating Wounds of the Chest

Puncture or gunshot wounds of the chest wall are of importance to the degree that they injure the thoracic contents or cause hemorrhage or infection of the pleural cavity The history of the injury and the physical findings give evidence The absence of evidence of fluid in the chest and expectoration of blood gives presumptive evidence that no serious complication exists Simple pleurisy may result from injury of the parietal pleura alone.

Diagnosis.—Stab wounds may reach a rib only and gunshot injuries often follow a rib so that injuries of this sort are not necessarily indicative of a penetrating wound.

Treatment.—In the absence of evidence of intrathoracic injury the external wounds should be rendered aseptic and the chest placed at rest. If necessary it may be immobilized by means of adhesive strips If the patient is restless, complains of pain or coughs, morphine should be given

DISEASES OF THE BREASTS

Developmental disturbances inflamed encapsulated tumors chronic interstitial changes and carcinoma compose the chief diseases which affect this organ There is no other organ in the body which taxes the resources of the surgeon more than the diseases of the breast Therefore even those conditions which fall properly within the province of minor surgery must be regarded with suspicion.

Developmental Disturbances

Small babies sometimes have a hardening about the nipple It lasts but a few days at most unless grandmother in her zeal to prevent trouble, massages the breast vigorously and brings about a mild traumatic mastitis. Even in spite of this treatment spontaneous recovery takes place in about ten days.

Not infrequently girls at puberty show marked development of one breast while the other still retains the state of childhood.

The developing breast is symmetrical and aside from an occasional sense of fullness, gives no trouble. After some months the lagging breast takes on rapid development and soon overtakes its fellow. This condition is of no importance except that occasionally some enthusiastic operator diagnoses a tumor and amputates the innocent breast.

Sometimes both breasts develop inordinately. This usually occurs in young women but may occur later in life. Without known cause both breasts begin to enlarge, sometimes reaching as low as the spine of the ilia. They cause disturbance only from their size. They are soft, flabby and fat like.

In boys, about the age of seventeen to twenty a hardening is sometimes felt about the nipple. It is as if a half dollar of double thickness were imbedded in the breast beneath the nipple. It is somewhat tender and elastic and may cause the patient some apprehension.

Diagnosis.—Knowledge of the existence of the conditions above described is equal to a correct diagnosis. They resemble nothing else. The confusion of the masses in young boys and the unilateral development of the breasts in young girls with malignant disease can be experienced only by those wholly ignorant of both affections.

Treatment.—None of these patients require any treatment. Sometimes much effort must be expended on the mother to prevent her from having her children's breasts needlessly amputated. When the hypertrophy becomes so marked that the masses become burdensome partial resection must be done. An amount equal to a normal breast should be left to retain the physical contour as much as possible.

Inflammation and Abscess

Inflammation of the lactating breast is a common affection. It follows infection through minute fissures of the nipple. It is accompanied by caking, fever and pain. The constitutional disturbance is sometimes that of a general sepsis. The abscess is usually seated within the parenchyma of the gland, but may be located behind it or superficially to it. Not uncommonly the abscesses are multiple. During the early stages of the infection there is intense turgescence of the whole breast. As the abscess

begins to form the remainder of the breast becomes less firm and the skin regains its normal color, while the region of the forming abscess becomes harder and the skin covering it may become reddened After some days fluctuation may occur in the region of the abscess Late in lactation localized abscesses in the glandules of Montgomery form These abscesses are located at the site of one of these glands are always superficial, and do not



Fig. 225.—Abscess in breast of a boy aged four years.

attain a size larger than a hickory nut They are not attended by marked constitutional disturbance Chronic abscesses within the breast are sometimes seen independent of lactation. Inflammation of the nonlactating breast may be caused by trauma and sometimes by the unskillful use of hypodermoclysis

Inflammation in the breasts of infants is common and is occasionally seen in children These rarely come to suppuration (Fig 225) In the induration stage they are occasionally needlessly operated on as tumors.

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Sometimes both breasts develop inordinately This usually occurs in young women but may occur later in life Without known cause both breasts begin to enlarge sometimes reaching as low as the spine of the ilia They cause disturbance only from their size They are soft, flabby and fat like

In boys about the age of seventeen to twenty a hardening is sometimes felt about the nipple It is as if a half dollar of double thickness were imbedded in the breast beneath the nipple It is somewhat tender and elastic and may cause the patient some apprehension.

Diagnosis—Knowledge of the existence of the conditions above described is equal to a correct diagnosis. They resemble nothing else. The confusion of the masses in young boys and the unilateral development of the breasts in young girls with malignant disease can be experienced only by those wholly ignorant of both affections

Treatment.—None of these patients require any treatment. Sometimes much effort must be expended on the mother to prevent her from having her children's breasts needlessly amputated When the hypertrophy becomes so marked that the masses become burdensome partial resection must be done. An amount equal to a normal breast should be left to retain the physical contour as much as possible

Inflammation and Abscess

Inflammation of the lactating breast is a common affection It follows *infection through minute fissures of the nipple* It is accompanied by 'caking' fever and pain. The constitutional disturbance is sometimes that of a general sepsis. The abscess is usually seated within the parenchyma of the gland but may be located behind it or superficially to it Not uncommonly the abscesses are multiple During the early stages of the infection there is intense turgescence of the whole breast As the abscess

begins to form, the remainder of the breast becomes less firm and the skin regains its normal color, while the region of the forming abscess becomes harder and the skin covering it may become reddened. After some days fluctuation may occur in the region of the abscess. Late in lactation localized abscesses in the glandules of Montgomery form. These abscesses are located at the site of one of these glands, are always superficial, and do not

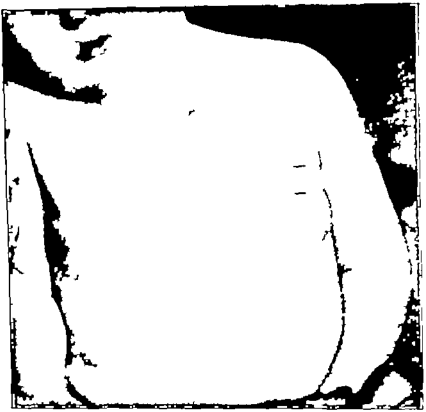


FIG. 225.—Abscess in breast of a boy aged four years.

attain a size larger than a hickory nut. They are not attended by marked constitutional disturbance. Chronic abscesses within the breast are sometimes seen independent of lactation. Inflammation of the nonlactating breast may be caused by trauma and sometimes by the unskillful use of hypodermoclysis.

Inflammation in the breasts of infants is common and is occasionally seen in children. These rarely come to suppuration (Fig. 225). In the induration stage they are occasionally needlessly operated on as tumors.

Diagnosis—Abscesses of the breast usually begin about ten days postpartum When they begin with chill and high temperature the attendant is apt to think of puerperal sepsis. The late date may give him some comfort, for sepsis begins usually within the first three or four days When reddening of the breast begins the condition is easily recognized The question of the formation and localization of the abscess must be determined by the physical findings When there is a residual mass with continuation of the constitutional symptoms abscess may be diagnosed To await fluctuation before the diagnosis is made is to subject the patient to needless pain. The glandules of Montgomery form localized abscesses which usually come at the end of lactation not at the beginning as is true of parenchymatous abscess Chronic abscesses make hard masses the walls of which are sometimes carcinomatous They cannot be told from colloid adenomas until they are cut into during the course of an operation Occasionally lactating breasts become stony hard This hardness is caused by infiltration in the connective tissue like the woody phlegmon of the neck In time it will resolve Still more rarely such an induration is caused by a carcinoma. Usually this occupies but one segment of the breast.

Treatment—The prevention of abscess depends on an aseptic management of the nipple at the beginning of lactation. Once inflammation begins supporting the breast with a smooth, snug but not too tight bandage gives comfort and may aid in preventing abscess When an abscess forms it must be opened freely in lines radiating from the nipple so as to do as little damage to the milk ducts as may be possible A general anesthetic is necessary Abscess in a glandule of Montgomery is easily opened under local anesthesia. The chronic abscesses should not be approached until all preparations are made for a radical operation should malignant areas be discovered

Encapsulated Tumors

Encapsulated tumors comprise the fibroadenomas and the intercanalicular fibroadenomas. The former is solitary round or ovoid and completely encapsulated and when the breast is palpated they glide freely about under the skin The latter are often

multiple, frequently bosselated and not so completely encapsulated (Fig 226) They both occur in young women, glide freely about under the examining finger and are free from retraction of the skin and nipple Malignancy rarely results The adenofibromas when they show malignancy do so by the proliferation of the epithelial elements. The intercanalicular fibroadenomas on the other hand do so by the development of the interstitial tissue They are then sometimes called sarcomas When they take on this rapid development they become large somewhat

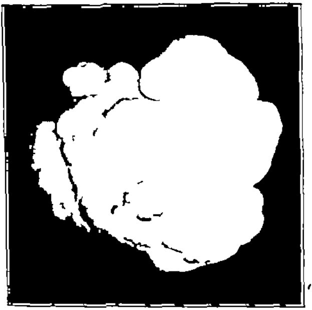


Fig. 226 —Fibroadenoma intercanaliculary of the breast.

bosselated tumors but even then they show little real malignancy and scarcely deserve so ominous a name as sarcoma

Diagnosis—The exquisite encapsulation of both these tumors is characteristic Cysts may simulate them imperfectly They are attached to the surrounding tissue and do not glide under the examining fingers Occasionally carcinomas form round ovoid tumors without the usual retracting bands. These tumors are more dense than the benign ones and never show such definite encapsulation. When the fibroadenomas become malignant they break through their capsules and present dense nodules attached to the surrounding tissues. The canalicular fibroadenomas grow rapidly and make large tumors even as large as an adult head

but show no marked change in form or consistency Clinically the approach to malignancy must be judged entirely by their rate of growth.

Treatment.—Complete removal results in a cure. The fibroadenomas may be shelled out. Interclavicular fibroadenomas should have their capsule removed with them particularly if they have undergone rapid growth It is unnecessary to remove the contents of the axilla even after they have taken on rapid growth. Recurrence does not take place

Chronic Interstitial Mastitis. Senile Parenchymatous Hypertrophy

Sometimes in young women about the age of thirty particularly in neurotic women, the interstitial connective tissue becomes hard giving the whole breast the feel of a dense elastic pad laid on the chest. Often there is tenderness to pressure and there is usually spontaneous pain, particularly at the menstrual period Much more frequent is the type occurring about the menopause The interstitial tissue likewise is firm and there are often small cysts (Fig 227) These breasts present a nodular feel through the whole breast and usually both breasts are affected There is little if any tenderness to pressure but usually there is discomfort or actual pain particularly at the menstrual periods The skin is not attached there is no retraction of skin or nipple and no hard mass can be made out

Diagnosis—The condition itself is easily recognized. There is the one paramount question as to whether or not an area has become malignant. This is the most important and difficult problem which comes to the tumor expert If there is a malignant area big enough so that it can be perceived as a mass with hard excrescences or bosselations if there is retraction of the skin or nipple, or if there are small hard glands in the axilla, the diagnosis is made easily In many instances the malignant area is so deeply imbedded in the interstitial connective tissue that it can not be felt and it does not affect the skin or nipple In such cases a diagnosis cannot be made until the area is exposed by making an incision into the breast tissue at the operating table When one is justified in making a diagnostic incision is difficult to answer When there is pain at times other than at the men

strual period, particularly if the patient is not neurotic, then exploration is warranted Women who have borne children are less likely to complain of pain needlessly than the sterile or unmarried If the pain is cutting or sticking it is more significant than if there is only a full heavy feeling If there is no area to be found which is firmer on palpation than the remainder of the gland the upper outer quadrant of the gland should be first explored



Fig. 227—Interstitial mastitis with cysts.

Treatment.—If there is no sign of malignancy the neurotic may be given bromides If those at the menopause complain of hot flashes, they may be given hyoscine or belladonna in addition to the bromides. If they have no complaint but are merely apprehensive the simple assurance that there is no evidence of malignancy suffices. If there is justifiable doubt the exploration of the breast should be undertaken. If there is no malignancy

evident when the suspected area is cut into it may be excised for microscopic study and the rest of the breast allowed to remain If a malignant area is found, radical operation follows.

In interstitial mastitis suspected areas may be explored or cysts removed under local anesthesia Since the interstitial tissues of such breasts are very tough and elastic considerable care is necessary to properly infiltrate them When the suspected part has been removed, care must be given to hemostasis because this tissue tends to ooze after the operation A small drain may save a hematoma and consequent delay in healing



Fig. 228.—Retraction of the nipple in carcinoma of the breast. A beginning. B advanced.

Carcinoma

Carcinomas of the breast must be recognized early if cure is to be obtained The chief sign is some form of retraction usually of the skin or nipple The classical retraction of the nipple is a late sign (Fig 228) Before retraction develops there is a limitation of mobility If the affected nipple is pulled upon it may be observed that it is not so mobile as the unaffected one, that is it cannot be pulled out so far The same thing may be observed by allowing the patient to sit upright with the breasts hanging loosely (Fig 229) On the affected side the nipple will

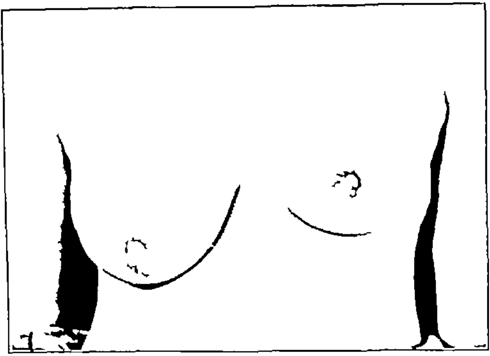


Fig. 29.—Carcinoma of the breast. Note that the left nipple lies on a higher plane than the right.

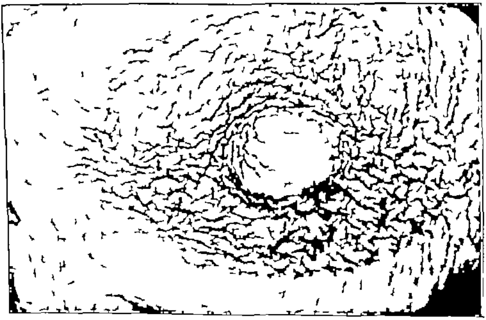


Fig. 30.—"Orange peel skin" in deeply situated carcinoma in a large breast.

be on a higher plane because of the shortened fibrous bands behind it Often when the tumor is situated elsewhere than behind the nipple the skin may be seen to dimple at a certain point. This produces the so-called orange peel effect (Fig 230) These signs are particularly useful in buxom women with large breasts In thin women the tumor usually can be felt without difficulty It is of bony hardness, irregular in outline and un encapsulated



Fig. 231 —Carcinoma of the breast involving the skin simulating an inflammatory process.

Diagnosis.—When the signs above noted are present one must have a thought that such retraction may be due to a past inflammation. The history should shed light on this. It must be remembered also that a past inflammation may lay the groundwork for a carcinoma Likewise a carcinoma lying just beneath the skin may be mistaken for an abscess (Fig 231) It is only when there has been abscess formation with incision that one is warranted in accepting a retracted nipple or an area of skin retraction as possibly due to a past infection The greatest difficulty in discovering carcinomas is encountered in senile parenchymatous hypertrophy This

has already been discussed under that heading Tuberculosis rarely affects the breast It is superficial and tends to form a sinus When it has not yet formed a sinus it is attached to, and forms a part of, the skin The presence of small hard glands in the axilla is very suggestive of malignancy in the breasts. Old inflammatory glands are less hard and usually more flat In buxom women lobules of fat may be mistaken for glands When glands are found the other axilla and the groins should be examined to determine whether the patient is suffering from a general adenopathy

Treatment.—The treatment of carcinoma of the breast is of course radical operation If one is not certain as to the diagnosis before the operation the suspected area should be cut into at the beginning of the operation in order to definitely establish the diagnosis. The result of an operation may be determined with a certain degree of probability In a patient in whom the axillary glands are not involved the chances of cure are about 25 to 40 per cent If the axillary glands are involved not more than one in ten will be permanently relieved. Young women and buxom matrons around forty practically all have recurrences In elderly thin women nearly all are cured

DISEASES OF THE PLEURA

Inflammatory diseases of the pleura may be regarded as coming strictly within the province of the internist until an exudate forms So long as the exudate remains serous it becomes surgical only when the amount is so great as unduly to compress the thoracic viscera or if absorption fails to take place within a reasonable time Once the exudate becomes purulent it is surgical

Pleurisy with Effusion

The accumulation of serous fluid within the thoracic cavity is manifest by flatness on percussion and diminished breath sounds The level of dullness often changes with the change of position The x ray shows a shadow coextensive with the fluid accumulated

Diagnosis.—The collection of fluid from inflammation must be differentiated from a transudate caused by a failing circulation The serous character of the fluid is made probable by the ab

sence of a rise of temperature and leucocytosis Tumor is a rare cause of dullness in the chest, either directly from its bulk or by causing an exudate from irritation of the pleura Aspiration presents the final proof

Treatment—When the accumulation of the fluid is considerable, it must be withdrawn by aspiration. If the third or fourth rib is reached, aspiration is indicated. If it reaches the second rib aspiration is imperative Though thoracentesis is a simple procedure a certain finesse in technic saves the patient much suffering A simple hypodermic needle may suffice for thin chests when the exudate is thin. Generally a larger and longer needle is necessary A syringe capable of being boiled with the needle should be employed but if such cannot be obtained the needle should be boiled and the syringe chemically sterilized preferably with formalin The skin may most conveniently be prepared by painting with tincture of iodine or by washing with soap and water following with alcohol Many practitioners use no anesthetic in making the puncture Freezing effectually prevents pain in the skin from the initial prick but the effect is evanescent and is followed by after pain Salt and ice pressed against the skin for a minute or two lessens the sensibility to a considerable degree. Neither of these methods produces an anesthesia lasting long enough to permit careful exploration Injection anesthesia is, therefore preferable because it not only permits the operator to study the character of tissue through which the needle passes but if therapeutic measures are to follow, it enables the operator to proceed *with the operation at once* Ten or twenty *minims of* a 1 per cent novocaine solution is drawn into the syringe a fold of skin over the intercostal space in which the puncture is to be made is caught up between the thumb and forefinger so that it becomes anemic and thus less sensitive The needle is made to penetrate the skin at a slight angle and a few drops of the fluid are deposited in the skin The needle is then gradually forced inward immediately above the next rib below in order to avoid the intercostal vessels which lie in the groove of the rib above As the needle reaches the pleura the resistance is increased or the patient experiences slight pain. The remainder of the anesthetic fluid in the syringe is deposited at this point. An interval of a few seconds permits anesthesia to become effective and the

needle may then be pressed into the pleural cavity, whereupon the resistance is suddenly lessened The syringe is then steadied with the left hand while the right gradually withdraws the piston If fluid is present it should appear in the barrel of the syringe If no fluid appears, it is either absent or the needle may be too short to enter the thoracic cavity or the fluid may be too thick to pass through the needle If no fluid is present, the needle can be felt to strike the visceral pleura, and usually the patient complains of pain If there is doubt about the needle entering the cavity a longer one should be employed If the physical findings for fluid are definite and the case is of long duration the possibility of a fluid too thick to pass the needle must be entertained and a needle of larger caliber employed Adhesions at the site of puncture may give a negative aspiration In that event the same procedure must be repeated in other likely situations If the site of an adhesion is punctured, the needle enters the lung which is manifest by the entrance into the syringe of bubbles of air covered with blood

The correctness of the diagnosis having been demonstrated by exploratory puncture the matter of the removal of the fluid must be decided This may be best undertaken at the time of the exploratory puncture for it saves the patient a second annoyance and the doctor a second preparation The clinical diagnosis should be sufficiently accurate to determine the character of apparatus which will be required The exact point at which fluid will be obtained is known A tract for the aspirating needle in case aspiration alone is needed is already anesthetized the interval between the puncture and the aspiration permitting perfect anesthesia to take place

In the absence of more suitable apparatus a syringe holding a few drams, and fitted with a stopcock may be used It is a slow method and is trying to both patient and operator but it is possible to remove large accumulations with this simple apparatus. The most suitable apparatus is the Potain aspirator or a Sorenson suction apparatus.

All apparatus which comes in contact with the patient should be prepared by boiling The hands of the operator should not touch that portion of the needle which is to enter the tissue The needle is passed along the tract of the exploratory puncture

already anesthetized and this may be accomplished without pain. If the needle is none too sharp, it is often desirable to nick the skin with a scalpel so as to avoid an annoying degree of pressure. The preliminary use of the scalpel is particularly indicated when a trocar is used When the parietal pleura is passed, aspiration may begin.

Whether all the fluid obtainable is to be withdrawn at the first aspiration depends upon circumstances. In neglected cases when a considerable amount of fluid is withdrawn, a temporary irritation indicated by coughing may attend the expansion of the lungs or the replacement of the heart to its normal position may cause a sense of faintness Either of these sensations if at all marked should be a signal to the operator to desist In early cases the first evidence of discomfort is shown when the fluid is nearly all removed and the expanding lung causes the visceral pleura to come in contact with the end of the aspirator This pain can often be relieved by withdrawing the needle or by tilting the tip downward. When the operation is ended the aspirator is withdrawn and the wound is closed with gauze and collodion or adhesive plaster If it is necessary to interrupt the aspiration before the fluid is all withdrawn the operation should be repeated after an interval of a few days. It is best to aspirate several times than to exhaust the patient at the first sitting

Empyema

The presence of pus in the thoracic cavity is usually evidenced by the signs of fluid above enumerated plus temperature and leucocytosis. Aspiration must always be regarded as a part of the evidence necessary for the establishment of a diagnosis.

Diagnosis—*Subphrenic abscesses may be mistaken for em*pyema as may lung abscesses and tumors, particularly metastatic sarcomas As already noted aspiration gives the only certain sign In doing a diagnostic aspiration one must be sure the needle is long enough to reach into the pleural cavity and the lumen is large enough to allow the thickened pus to be drawn through it This means that the needle must be at least 2 inches long and at least of 18 caliber

Once the presence of pus is established its removal is planned If there is much dyspnea and circulatory disturbance it may be

well to withdraw some of the pus to allow the patient to gain his equilibrium in a measure When this is accomplished some means of permanent drainage must be secured This should not be undertaken until the lung above the fluid has had time to be come attached to the chest wall This usually requires about three weeks If this is not done the lung will completely col lapse when the chest is opened Many measures have been rec ommended for securing drainage In children this is satisfac torily accomplished by the introduction of a fair sized (say 26 F) soft rubber catheter through a simple intercostal incision Some times the catheter is pushed through the sleeve of a large trocar after which the latter is withdrawn It is often possible to em ploy this method under local anesthesia in quite young children It is especially efficient also when permanent suction is to be applied to the drainage tube Permanent suction has been ac complished in various ways The simplest method is by the permanent application of a Potain aspirator the negative pres sure in the receiving bottle being kept at the point of easy tolerance

In empyema in older persons the resection of a rib is necessary in order to secure satisfactory drainage. The diagnosis is less certain than in case of serous effusion by physical means alone Before operation it is always advisable to verify the diagnosis by puncture. The resection of a rib is a simple operation but since it is always done upon a dyspneic patient the complications are often annoying Instruments sufficient to meet all possible emer gencies should always be at hand. Aside from the usual syringe and solution for local anesthesia a rib shears or a bone-cutting forceps a periosteal elevator, knife scissors and a number of hemostats and a needle threaded with catgut should be provided. The latter may be needed should the intercostal vessels be inad vertently severed The site of operation is selected, usually the seventh or eighth rib at the midaxillary line A line of skin 3 inches long is injected over and parallel with the rib selected for removal. The muscle layer covering the ribs must be thor oughly infiltrated. The area immediately beneath the rib at both ends of the line of injection is infiltrated in such a manner as to deposit a pool of fluid about the intercostal nerve (Fig 232) The needle should then glide just over the periosteum and the

fluid be deposited over the rib It is not necessary that the needle pass beneath the periosteum A wait of a few minutes permits anesthesia to take place An incision is made through the skin the length of the line infiltrated The muscle over the rib is next incised. All hemorrhage should be controlled at this point The periosteum over the rib is then incised for a distance of two inches. The periosteum is elevated from the rib about its entire circumference care being taken to remove it from the groove containing the intercostal vessels (Fig 233) The pleural sur

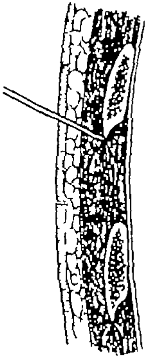


Fig 232—Injection of intercostal nerve. The needle passes close under the lower border of the rib.

face of the periosteum must not be perforated. The periosteum being loosened for the entire distance of the incision the rib may be cut At least two inches should be removed The open ing thus made has for its floor the parietal periosteum. If the intercostal vessels have been cut, they may be controlled by mass ligatures through the muscle When all hemorrhage has been checked the drainage tubes are made ready the periosteum is quickly incised (Fig 234) and the tubes are passed into the open ing The tubes must be sutured to the skin in order to prevent their slipping into the thorax. Many operators permit the pus

to flow out before a dressing is applied others prefer to apply a large snug dressing quickly and permit the pus gradually to soak into it If the parietal periosteum is inadvertently opened before the rib is resected, the pus flows at once and the cutting of the rib and the control of any hemorrhage that may ensue must be done in a puddle of pus The dressings must be removed

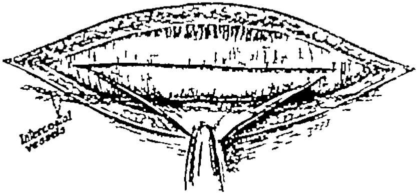


Fig. 33 —Partial levation of the periosteum.

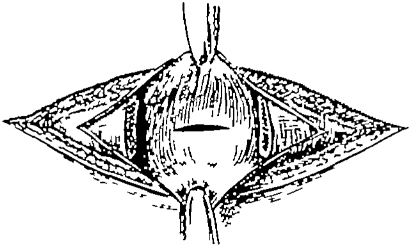


Fig. 224 —Elevation of the periosteum completed, the rib is removed and the parietal pleura incised.

as they become soiled After the flow has lessened the tubes are gradually shortened and can usually be removed in from two to six weeks, depending on the nature of the infection, the earlier period if the pneumococcus or influenza bacillus is the infective agent, the longer if the empyema is secondary to some infection of the abdomen or pelvis.

CHAPTER XI

DISEASES OF THE ABDOMINAL WALL

The diseases of the abdominal wall fall almost wholly into the tumors of the soft parts and hernias. The skin is subject to the affections common to this structure elsewhere. Many of the tumors common to this region are rare in other parts of the body. Sometimes the question whether a tumor belongs to the abdominal wall or whether it lies within the abdominal cavity must be answered. The hernias alone are distinctive of this region and furnish the most frequent problems.

TUMORS

The skin, the fatty tissues and fascia, and less often the muscles, each contributes its quota of tumors.

Cutaneous Tumors

Tumors common to the skin elsewhere on the body are found on the skin of the abdominal wall. Fibromas, warts more or less sessile, are commonly observed. Angiomas are more rare and furnish no special problem. Melanomas, however, in this region are of concern because they not infrequently become malignant. Solitary melanotic tumors in this region should always be removed as a prophylactic measure. Metastatic tumors are often seen here (Fig. 235). Neurolipomas may resemble the metastatic tumors (Fig. 236), but they are less closely attached to the skin.

Lipomas

The abdominal wall is one of the most common sites of fatty tumors. When small they form globular tumors situated beneath the skin, smooth or crenated, soft and semifluctuating. When larger they tend to become pendulous (Fig. 237). Save for their size they are of little clinical importance. It is only

when they simulate other more important affections that they become objects of interest

Diagnosis—When small they may be mistaken for wens though these are rare tumors on the anterior abdominal wall



Fig 235—Metastatic carcinoma of the skin secondary to carcinoma of the stomach.

Occasionally aberrant breasts (Fig 238) may simulate a lipoma These however have a pigmented area on their summit in the center and usually a protuberance resembling a nipple The substance has a glandular feel not often found in lipomas In

the midline small fatty masses are often found which are in fact fatty tumors, but these have at their base pouches of peritoneum and are best discussed as hernias of the linea alba. Other hernial openings may present lipomas which have hernial sacs at their base Occasionally a scar hernia is mistaken for a lipoma. The presence of a scar makes such an error ridiculous. Occa



Fig. 236 —Neurofibromas of the abdominal wall.

sionally a slowly developing abscess may be mistaken for a lipoma Usually there is a history of some preceding affection, painful in character such as tubercular or other bone affections, preceding the swelling Besides an abscess is truly fluctuating while a lipoma is not

Treatment.—Lipomas should be removed because of the discomfort they cause When small, local anesthesia is simple it may be employed in large ones, but it is then somewhat laborious.



Fig. [illegible].—Pendulous lipoma of the abdominal wall.

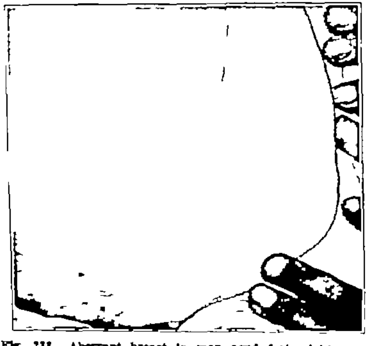


Fig. 232.—Aberrant breast in man aged forty-eight years.

Bald headed Sarcomas

The anterior abdominal wall is the most frequent site of this tumor The term is my own coining and is intended to be descriptive of its surface appearance and of its clinical characters. It is characterized by very slow growth attachment to the skin, and free mobility over the deep fascia The thinned



Fig. 239 —Bald-headed sarcoma. Note the reddened thin skin covering its summit.

skin covering its surface is distinctive (Fig 239) This area is pinkish or deep reddish in color and often contains large blood vessels. At first glance they present the appearance of a spina bifida. After growing very slowly for many years they may rather suddenly take on a more rapid growth. They may then ulcerate through the thinned skin and present a red bleeding

surface (Fig 240) When they grow rapidly they tend to become bosselated They present a rather distinct encapsulation, but when shelled out they tend to rapid local recurrence Metastasis is usually by way of the lymphatics In this they resemble the melanoblastomas.

Diagnosis—The thinned reddish skin covering their summit is quite characteristic of them Their free mobility distinguishes them from any tumor of the abdominal muscles

Treatment.—They must be removed together with their capsules. When merely shelled out, they tend to recur locally and

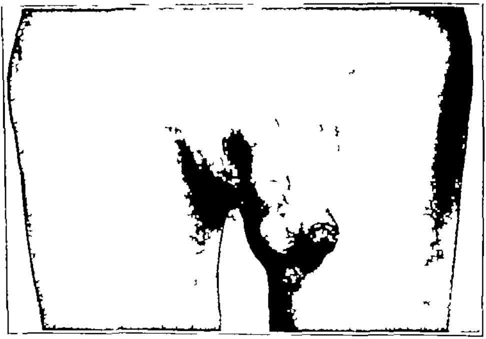


Fig 240—Fibrosarcoma of the inguinal region. This is a recurrent tumor Note the necrotic area at its lower extremity

ultimately to spread to tissues which make removal impossible. Even when local removal is followed by recurrence, a very radical operation may produce a permanent cure

Desmoids

These tumors spring from the abdominal fascia or muscles and form round hard tumors which grow slowly and cause little or no pain. They occur most frequently in women and usually only in those who have borne children. The recti muscles are

the most common site but they may occur in any part of the abdominal muscles I have observed one in the pectoralis major muscle Though usually of slow growth being essentially a fibrosing myositis in most cases they sometimes take on rapid growth and invade the surrounding tissue becoming essentially sarcomatous

Diagnosis.—They are firmer and more deeply seated than lipomas and being free from the skin, they are easily distinguished from the tumors discussed in the preceding section. From their hard character they are apt to be confused with intraabdominal tumors They may be distinguished from intraabdominal tumors as follows When the patient puts the abdominal muscles on the stretch intraabdominal tumors become less distinct or impalpable Desmoids remain distinctly palpable no matter how tense the muscles become

Treatment.—Since in rare instances they take on a more rapid growth they should be removed as soon as they are diagnosed. They form a part of the abdominal wall and in their removal a considerable defect may be caused All the resources necessary for a laparotomy must be at hand when they are attacked. They belong therefore to the domain of major surgery

HERNIAS

Weak places in the abdominal wall which permit the protrusion of a part of a hollow viscus is the most common lesion of the abdominal wall. Three regions are chiefly involved the umbilical, inguinal, and femoral The latter having their point of exit below Poupart s ligament strictly speaking do not appear on the abdominal wall, yet the defect they represent is a part of the enclosure of the viscera, and therefore a part of the abdominal wall. Besides they are so closely associated with inguinal hernias that on clinical grounds it is desirable to treat them in the same chapter

Umbilical Hernias

The navel hernias occur most frequently soon after birth or after middle life They are common in the first months or years of life forming a bulging of the umbilicus. Usually the open

ing is but little larger than a lead pencil and the protrusion is small Large hernias in this region in children are rarely seen The umbilical hernias of later life are more important affairs They are usually observed in corpulent persons The mechanism seems to be that the development of the adipose tissue pulls on the navel scar producing a dimpling on the abdominal side The intraabdominal pressure gradually dilates it until a hernial sac of considerable size results The usual size is from that of an apple to a grapefruit but may be very much larger, so large in fact, that they contain the major portion of the small intestines and the transverse colon Sometimes they are so small that they do not protrude beyond the level of the surrounding abdominal skin and their presence becomes apparent only on palpation. Usually a pedunculated tumor is apparent at a glance The opening usually is much smaller than the tumor Generally the opening is from 5 to 7 cm in diameter A mass of adherent omentum usually forms the contents of the sac but coils of intestine both small and large may make their permanent habitat within the hernial sac When the opening is small coils of intestine may gain access to the sac and become imprisoned giving the usual picture of intestinal obstruction.

Diagnosis —The recognition of the hernia in infants is an easy matter The slight bulging when the child cries and the presence of a small opening evident to the palpating finger are characteristic. Occasionally a persistent Meckel s diverticulum may protrude at the navel These are usually covered by a red granulating surface Navel hernias of adult life when small are felt as rounded masses below the umbilicus Usually the ring of the abdominal opening can be made out The larger ones may present large pendulous masses (Fig 241) When the imprisoned omentum becomes constricted it may become firm even hard to the touch These must be differentiated from carcinomas traveling along the round ligament from the stomach or the hypogastric folds from the pelvis. These are harder than the infiltrated omentum and often the primary tumor can be palpated. These secondary malignancies may form rounded masses (Fig 242) or they may ulcerate (Fig 243) The large hernias containing masses of omentum are distinguished from lipomas by their situation.



Fig. 241.—Large pendulous umbilical hernia.

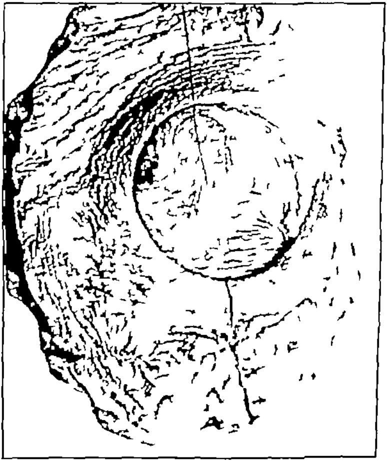


Fig. 242.—Carcinoma of the umbilicus secondary to carcinoma of the ovaries.



Fig. 243.—Ulcerating carcinoma of the umbilicus secondary to carcinoma of the stomach.

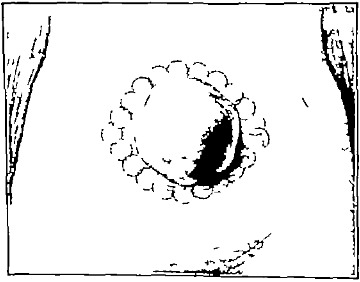


Fig. 244.—Line of infiltration about an umbilical hernia.

Treatment.—The small hernias of childhood reduce easily and heal spontaneously. The application of trusses or the strapping of *a coin over them is worse than useless.* It is rare that they persist and require operation. Umbilical hernia in the adult always demands operation. If let alone they tend to become pro-

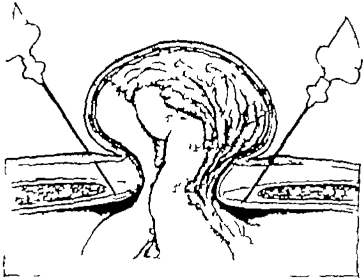


Fig. 245.—Infiltration of the layers of the abdominal wall in umbilical hernia. The skin has not been incised.

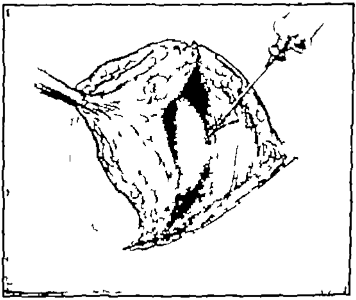


Fig. 246.—Infiltration of the fascial layer of the abdominal wall in umbilical hernia. Half the circumference of skin and fatty layer has been incised and raised up showing the point of entrance for the needle in injecting the fascia, *muscle and peritoneum.*

gressively larger and may at any time become the site of strangulation When strangulation begins immediate operation is of course, imperative The technic best done under local anesthesia is as follows

An ellipse is infiltrated about the hernia at such distance from the sac as to make the ring easily accessible (Fig 244) The fatty layer should be injected through the primary line of infiltration The fatty layer is not very painful and the amount of

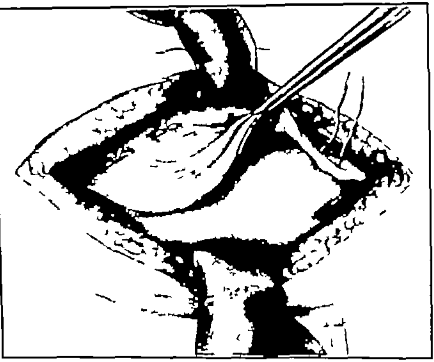


Fig. 24 —The hernial ring has been freed and the lower border is being imbricated beneath the upper flap.

fluid injected should be small. Even without injection section of the fat is painful only when large fascial septa are cut

If the operator is experienced and the abdomen not too fat the abdominal walls about the ring may be anesthetized through the primary line of infiltration before the skin is incised The fascia about the ring is freely infiltrated (Fig 245) This gives complete anesthesia If conditions are less favorable the following plan is more certain the skin is incised through the primary infiltration line and the fascia is exposed, as shown partly accomplished in Fig 246 The abdominal wall about the ring

is then infiltrated (Fig 247), fluid being injected just beneath the fascia into the muscle and particularly just above the transversalis fascia The distance from the ring at which the injections should be made depends upon the size of the opening If *it is large or if extensive overlapping of the edges of the ring* will be required the injection should be made at least an inch from the margin If the opening is small the injection should be made close to the ring (Fig 245) By this injection the ring is effectually anesthetized for all future manipulations

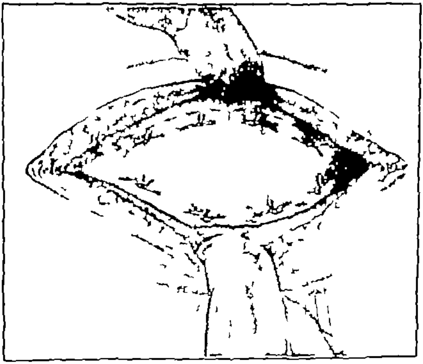


Fig 248—The upper flap is shown over the lower flap previously imbricated.

The sac is now opened and adhesions of omentum and gut freed from the ring and from each other Any excess of omentum is excised

The flaps are now prepared for overlapping Any degree of *imbrication is possible and there is no rigidity* of the muscles or increase in intraabdominal pressure when the sutures are passed The usual Mayo technic may be followed (Figs. 247 and 248) or *the overlapping may be done laterally The epinephrin gives* a bloodless field which makes the technic easier but all raw

edges should be protected by suture to prevent oozing. The fatty layer is not sutured. The skin is closed so that the needle does not pass beyond the primary line of infiltration. If the hernia is a large one it is well to provide drainage for a few days.

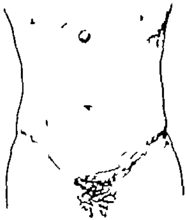


Fig. 249.—Hernia of the linea alba.



Fig. 250.—Hernia of the linea alba. The irregular lobulation is shown. The ends of the round ligaments are marked.

Hernia of the Linea Alba

As a corollary to the foregoing are the small hernias in the linea alba (Fig. 249). When large they show small protrusions in the midline. When not visible they can be readily felt as small nodules free from the skin but attached to the fascia. They are never the site of strangulation but they are often attended by marked digestive disturbances and loss of weight.

Diagnosis.—They are easily recognized by palpation as small smooth, relatively soft tumors free from the skin but firmly fixed to the underlying fascia. When of greater size, the border may be irregular like the secondary lobules of a lipoma (Fig 250). Dermoids are occasionally found in the midline and small solid tumors containing glandular tissue, evidently congenital are sometimes found in the midline. These sometimes give rise to malignant tumors. After a hernia alba has been diagnosed



Fig 251.—Small bulging indirect inguinal hernia.

care is needed in ascribing to them all coexisting digestive disturbance. Other digestive disturbances notably carcinoma must be sought as a possible cause for the loss of weight which so often accompanies them.

Treatment.—When proved to be the source of trouble the herniated masses must be removed by operation. The mass is cut down and dissected free. The fascia may be merely approximated or closed by imbrication. The technic is the same as for umbilical hernias.

Inguinal Hernia

The inguinal canal is the most common site of hernia. The hernias in this location are of two types. Protrusion of a loop of gut through the inguinal canal is an indirect hernia. When the protrusion passes directly out of the external ring without traversing the canal, it is direct hernia. Generally there is a preformed canal persisting from the fetal state and the abdominal contents have but to dilate the canal in order to produce a

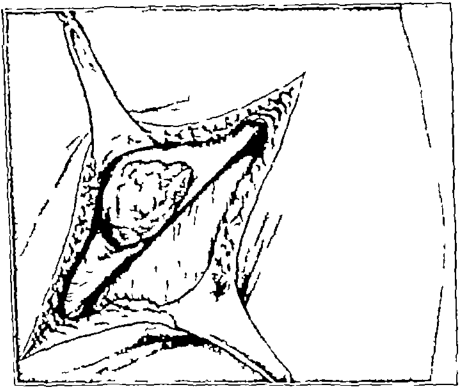


Fig. 52.—Inguinal hernia masked by lipoma. The hernial sac appeared when the lipoma was drawn upon.

hernia. The small hernias produce a characteristic bulging of the inguinal canal (Fig. 251). It begins about the midpoint of Poupart's ligament and extends to about the spine of the pubes. The presence of an impulse on coughing, the large external ring discernible on palpation, and the gurgling sound felt when the hernial contents slip back into the abdomen make recognition easy and certain. When the contents is omentum there may be but little impulse on coughing and no gurgling when it slips into the abdominal cavity. When a hernia cannot be returned

to the abdominal cavity, it is said to be irreducible In such instances the mass usually protrudes out of the external ring If the imprisoned contents are inflamed, the mass may be distinctly tender to the touch When loops of intestine are imprisoned in the hernia, the lumen is usually shut off and a strangulation is produced. The usual symptoms of intestinal obstruction are added to the symptoms of irreducible hernia

Diagnosis —The recognition of inguinal hernia is by no means always easy The presence of pain over the inguinal canal is often accepted as evidence of incipient hernia This assumption is nearly always wrong Hernia should not be diagnosed unless it can be objectively demonstrated Other structures may oc



Fig. 53 —Muscle splitting hernia above, femoral hernia below

cupy the dilated inguinal canal A lipoma about the cord may be indistinguishable from an irreducible omental hernia. Very often lipomas and hernias coexist (Fig 252) The hernia may be so covered by the lipoma that the diagnosis may cause some confusion during the early stages of the operation

The so-called muscle splitting hernias come out of the internal ring and instead of descending down the canal go upwards and outwards (Fig 253) The failure to move downward may cause them to be confused with lipomas Other tumors may lie in the inguinal canal and be mistaken for the cord. Fibromas of the round ligament (Fig 254) hydroceles of the cord ovarian hernias and the like In direct hernias a part of the bladder may protrude giving rise to urinary symptoms. Irreducible hernias which have become inflamed may resemble infections of the

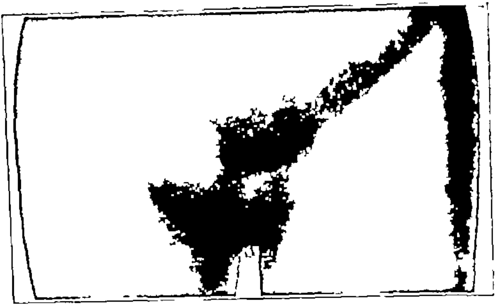


Fig. 51.—Fibrosarcoma of round ligament.

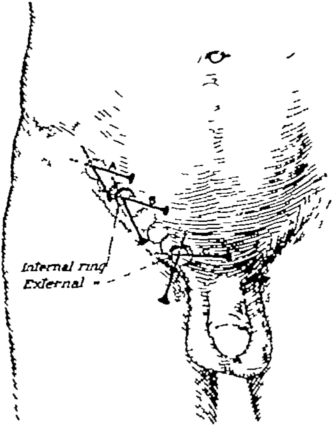


Fig. 52.—Nerve blocking for inguinal hernia. *A* Deep infiltration into the abdominal muscles to block the ilioinguinal and iliohypogastric nerves *B* Infiltration about the internal ring to anesthetize the attachments of the sac *C* infiltration about the pillars to block accessory and aberrant nerve filaments.

perform an operation for the relief of strangulation If strangulation is diagnosed early the radical operation can be added to the relief of the strangulation When strangulation has existed for some time it is safer not to close the wound

The details of the operation as best suited to the inexperienced operator follow The skin is infiltrated in the line of the inguinal canal extending from the root of the penis to a point lateral to the internal ring (Fig 255) If the hernia extends into the scrotum the infiltration may extend downward upon the scrotum (Fig 256) The subcutaneous tissue is infiltrated through this primary line and the nerves are blocked by extending the needle more deeply

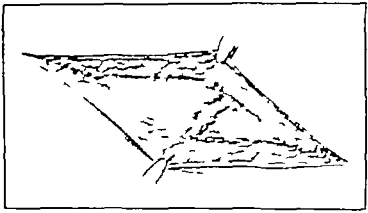


Fig 257 —Superficial deep epigastric vessels.

The incision is now made to expose the superficial deep epigastric vessels (Fig 257) These are clamped cut and ligated If the incision extends down far enough to reach the pubic vessels, these too must be identified clamped, cut, and ligated

When this fascia is exposed the pillars (*b*, Fig 258) and the muscle bundles at a point where they disappear to make the external oblique fascia (*a* Fig 258) are infiltrated. The infiltration at this point should be freely made so as to reach the cord and sac. This anesthetizes the area of the ring to which the sac is attached and prevents pain when the sac is ligated. The remainder of the fascia is not sensitive and may be freely divided. When divided, it is well to pick up the free edges and retain them with forceps in order that they may be readily identified at any time (Fig 259)

lymph glands The history usually comes to one's aid, the infection having the shorter history, but sometimes a portion of omentum becomes strangulated with a history of a quickly developing inflammatory reaction A lesion accountable for an infection should be discoverable in pyogenic cases. When strangulation takes place in a hernia the symptoms of intestinal obstruction are added to those of a hernia Very often the hernia has remained unrecognized at the time the intestinal symp-

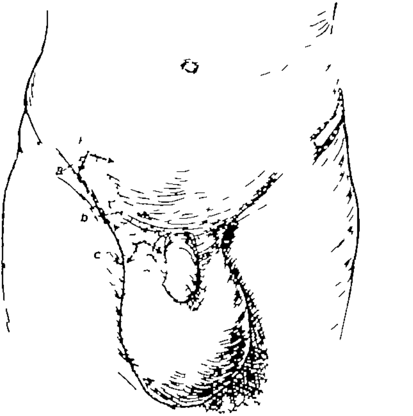


Fig. 254—Line of infiltration for inguinal hernia. *a*, Subcutaneous infiltration to reach the nerve accompanying the superficial infe for epigastric vessels *b*, infiltration superficial to the columns of the external ring to reach nerve twigs from the iliohypogastric *c* injection in the root of the scrotum supplied by the pudic and small sciatic nerves.

toms develop In all cases of obstruction therefore the hernial openings should be examined for a possible hernia which may have undergone strangulation.

Treatment.—All inguinal hernias should be operated upon There is no other method so certain to prevent a possible strangulation. Trusses may help for a time but sooner or later they fail to hold Every practitioner of medicine should be able to

perform an operation for the relief of strangulation If strangulation is diagnosed early the radical operation can be added to the relief of the strangulation When strangulation has existed for some time it is safer not to close the wound

The details of the operation as best suited to the inexperienced operator follow The skin is infiltrated in the line of the inguinal canal extending from the root of the penis to a point lateral to the internal ring (Fig 255) If the hernia extends into the scrotum the infiltration may extend downward upon the scrotum (Fig 256) The subcutaneous tissue is infiltrated through this primary line and the nerves are blocked by extending the needle more deeply

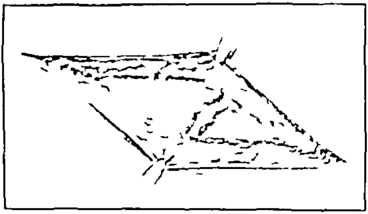


Fig. —Superficial deep epigastric vessels

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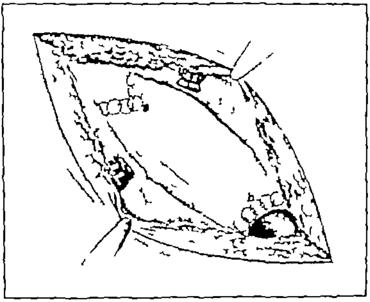


Fig. 2 8.—The fascia of the external ring is exposed. *a* Point of infil tion about the internal (lateral) ring *b* point of infiltration about the exte (median) ring.

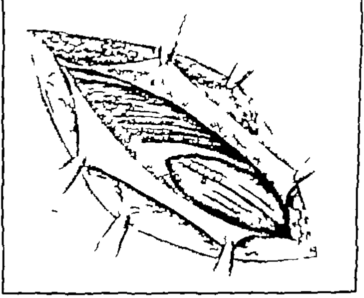


Fig. 259—The fascia of the external oblique is incised and the edges caught up by forceps and retracted. In the depths of th wound the co and sac are exposed showing the nerve at the summit. *a* Infiltration of iliolnguinal nerve at its xit from the int rnal canal *b* infiltration of muscle necessary only when the muscle is incised to permit greater displac ment of th cord.

The cord and sac now lie in the bottom of the wound. If the parts have been kept free from blood, the ilioinguinal nerve is now seen passing over the center to disappear down into the scrotum. This nerve is injected directly at the point where it emerges through the internal ring (a, Fig. 259). The sac lying above and external to the cord is now identified. It is grasped with forceps and raised up (Fig. 260). This carries with it the cord. The genital branch of the genitocrural nerve is now blocked by injecting the cord where it emerges from the ring (a, Fig. 260). The inferior deep epigastric vessels are seen in

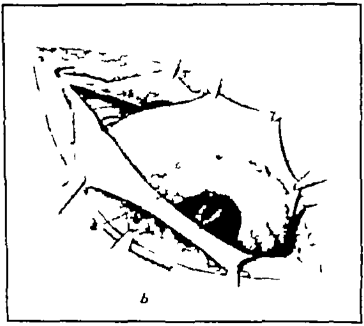


Fig. 260.—The cord is lifted from its bed with forceps. The sac shows above and below it, the cord including the vessels and fat. a, Point for injecting the cord; b, deep epigastric vessels.

the depth of the wound beneath the cord (b, Fig. 260). If these vessels are identified, they are not likely to be injured in suturing.

The sac is now separated, opened and ligated. If this causes pain, owing to previous imperfect injection, the sac may be injected about its base (Fig. 261). This is rarely necessary unless there are adhesions of viscera to the inside of the sac.

The closure of the wound is most easily accomplished by displacing the cord backward and uniting the conjoined tendon with Poupart's ligament in front of the cord (Fig. 262) or the

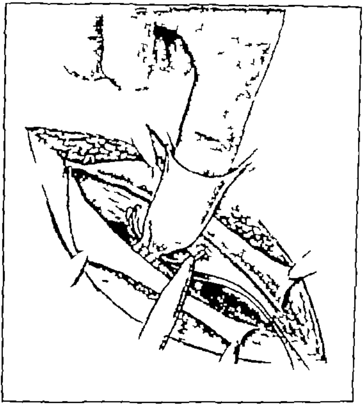


Fig 261.—The sac has been separated from the cord and opened to admit the finger A threaded needle is being passed eye end first through the base of the sac. The dotted line shows the points for infiltrating the cord.

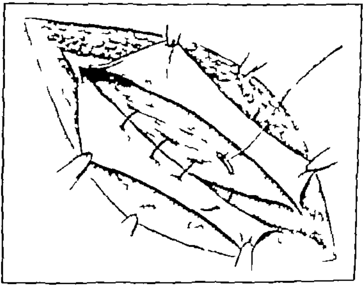


Fig. 262.—The sutures are being passed through the conjoined tendon and Poupart's ligament. The cord is behind this line of sutures.

The experienced operator will prefer to use preliminary nerve blocking. For this technic, see the author's book *Local Anesthesia*.

typical Bassini operation may be done. The suture of the fascia of the external oblique muscle and skin completes the operation.*

Femoral Hernia

The opening for femoral hernia lies beneath Poupart's ligament, and the hernia appears below this ligament (Fig. 263). As the hernia enlarges, it may come to lie over or even above the

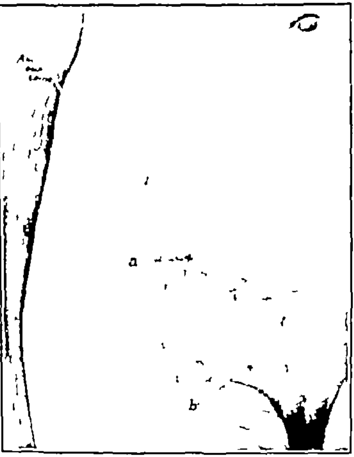


Fig. 263.—Skin infiltration about a femoral hernia. *a*, Point of entrance for infiltration about the neck of the sac. This point reaches the crural branch of the genitocrural. *b*, point for infiltration medial to the sac reaching the pudic nerves.

ligament, thus becoming confused with inguinal hernias. This is the common hernia of old women and is characterized by the appearance of a mass just below Poupart's ligament and medial to the femoral vessels. Since the opening is small, strangulation

*The experienced operator will prefer to use preliminary nerve blocking. For this technic see the author's book on *Local Anesthesia*.

is common The periodic appearance of a lump and its disappearance when the patient lies down is diagnostic

Other tumors may resemble this hernia Most common are lipomas A tumor here that is irreducible is likely to be a lipoma, for irreducible omental hernias are uncommon in this situation Most deceptive are those cases in which there is a hernia complicating a lipoma In such cases one finds a soft tumor that is irreducible and the history of the occasional en-

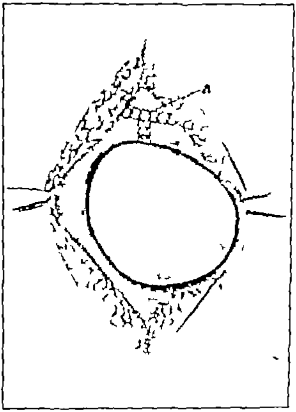


Fig. 264.—Infiltration of the tissues about Poupart's ligament.

largement of the tumor Sometimes one can feel the gurgling *of the loop of gut as it slips out of the sac encased in the lipoma*

All femoral hernias should be cured by operation It is rare that a recurrence follows operation for hernia in this region. In cases of strangulation immediate operation should be done If the gut is necrotic both loops should be drawn out of the wound and fastened and then opened producing a fecal fistula Anastomosis and cure of the fistula must be left for a later date The operation when the gut is viable is as follows

An elliptical skin line is infiltrated about the hernia with a linear extension upward and outward parallel with Poupart's ligament (Fig. 2[illegible]) or downward parallel with the saphenous vein.

From the initial infiltration line in the skin the tissues about the tumor are injected (a and b, Fig. 263). The medial side can be infiltrated with impunity, but the close proximity of the

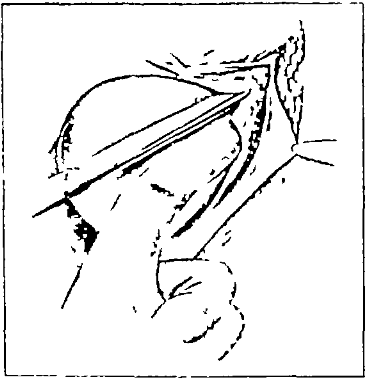


Fig. [illegible]6.—Poupart's ligament is being cut with scissors before the sac is opened.

femoral vein to the lateral side demands caution in passing the needle. Anesthetization of the neck can usually be accomplished by passing the needle through the lower edge of Poupart's ligament.

Infiltration being complete, the sac is exposed. Sometimes the manipulation of the sac is still painful and renewed infiltration of the tissues about it is required. With the sac exposed no difficulty is experienced in securing anesthesia by edematizing the surrounding tissue. The sac is ligated close to the ligament.

and the wound is closed in the usual manner, or Seelig's operation may be performed

In cases of strangulation the surrounding tissues are often edematous and a more extensive infiltration is required. Since these hernias are usually small, it is most convenient to edematize the tissue about the tumor independently of the surrounding structures By infiltrating the tissue just beneath Poupart's ligament the tissues about the neck may be anesthetized (Fig 264) It is best to pass the needle to the medial side of the neck of the sac in order to avoid the femoral vein After the sac is exposed, if it is not yet sufficiently anesthetized additional infiltration may be done In order to release the constriction about the neck of the sac, Poupart's ligament may be cut through (Fig 265) After the sac has been attended to the cut ends of Poupart's ligament are united to the underlying fascia In addition to making the operation easier this method closes the hernial opening

CHAPTER XII

DISEASES OF THE BACK AND SPINE

The diseases of the back comprise chiefly the affections of the soft parts, the congenital malformations, and diseases of the spinal column.

DISEASES OF THE SOFT PARTS

The affections of the soft parts are in general coextensive with the soft parts of other regions of the trunk, but they present a variation in type and character sufficiently characteristic to warrant a separate consideration.

Papillomas

The large soft pedunculated warts with narrow pedicles are often seen here. Save for the mechanical inconvenience they cause they are of little significance. Not infrequently, however, solitary warts are pedunculated. The old time-honored remedy of tying a string about the base is sometimes even in this day applied to these with the result that they are stimulated to malignancy. The melanotic warts usually occur in large numbers (Fig. 266). They are usually but little elevated above the surface and vary from white or yellowish to the intensest black. Curiously enough, the multiple type rarely develop malignancy. Quite different are the solitary. These frequently develop a malignant growth or metastasis and destroy the patient. The first evidence of disturbed growth is an increase in size and often an increase in vascularity of the skin about their base (Fig. 267). The local increase in size is usually inconsiderable, the malignant manifestation being exhibited in the development of melanotic tumors in the regional lymph glands.

Diagnosis.—The fibrous papillomas, generally pedunculated, are soft to the touch and of the same color as the surrounding skin. Melanotic pedunculated warts vary in color from light

brown to black and are firmer to the touch The recognition of melanomas both solitary and multiple is, of course, easy from the color Malignancy may be suspected when they increase in size, become indurated or if the surrounding skin becomes indurated or reddened The proof of it is furnished when secondary melanotic growths develop in the surrounding skin or by the involvement of neighboring glands or the appearance of



Fig. 264—Multiple melanotic warts of the back.

tumors elsewhere in the body Whenever a melanoma is encountered the tributary glands should be inspected. Conversely when enlarged glands are found melanomas in the drainage area should be searched for

Treatment.—Multiple melanomas need not be molested for the reason stated, that they seldom show malignancy Solitary melanomas on the other hand should always be removed whenever they are discovered in order that future trouble may be

avoided. Whether they show evidence of irritation or not they should be removed with a wide area of apparently normal skin. Once glands become involved all treatment is useless.

Lipomas

The back of the shoulder is the normal habitat of lipomas. They occur most frequently about the shoulder (Fig. 208). They

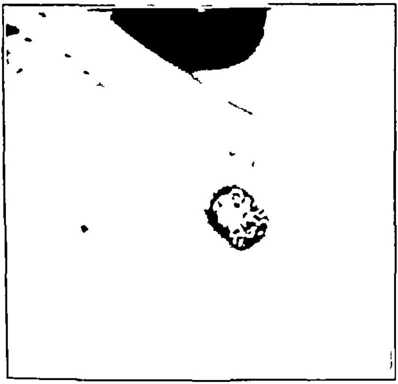


Fig. [illegible] —[illegible] glands [illegible] axill[illegible]

appear as rounded or lobulated tumors, sometimes as overhanging folds. They are soft, sometimes pseudofluctuating. Often the borders are serrated.

Diagnosis.—When small they may be mistaken for wens. Rarely fascial sarcomas imitate lipomas. They are more rapidly growing and have a more intimate deep attachment. When the tumor is situated in the midline a spina bifida should be suspected. Lipomas are nearly always to one or the other side of the midline.

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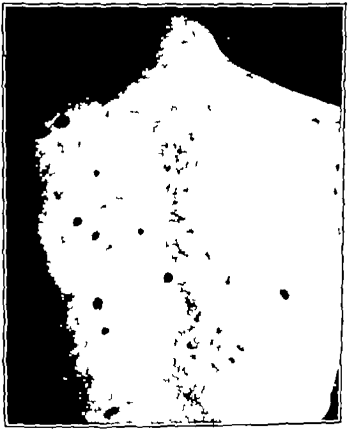


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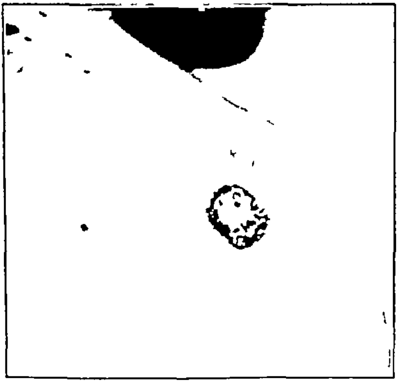


Fig. [illegible].—Irritated melanoma of the shoulder. Metastatic glands have developed in the axilla and mediastinum.

appear as rounded or lobulated tumors, sometimes as overhanging folds. They are soft, sometimes pseudofluctuating. Often the borders are serrated.

Diagnosis.—When small they may be mistaken for wens. Rarely fascial sarcomas imitate lipomas. They are more rapidly growing and have a more intimate deep attachment. When the tumor is situated in the midline a spina bifida should be suspected. Lipomas are nearly always to one or the other side of the midline.

Treatment—Lipomas are easily removed under local anesthesia Hemostasis should be carefully attended to lest the cavity left after the removal of the tumor fill with blood. A drain for a day or two does not delay healing and may save the aggravation caused by the formation of a clot in the wound

Wens

The ubiquitous wen is often found on the back particularly on the upper part near the nape of the neck They are often as large as an apple and have a tense boggy feel They are more

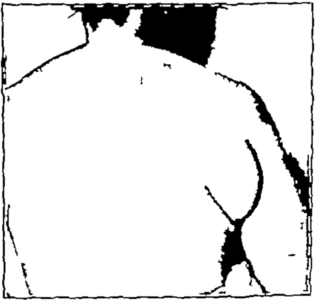


Fig. 268—Lipoma of the scapular region.

prone to undergo suppuration in this region than elsewhere Not infrequently malignancy develops in them

Diagnosis—Usually they are more nearly spherical than lipomas They may be mistaken for cold abscesses Here more than elsewhere they are prone to undergo malignancy

Treatment.—They should be shelled out When the base is hard they should be excised with a margin of healthy skin so that if the induration is found to be due to epithelial proliferation the patient will have been rid of a menace

Hemangiomas

The back is frequently the site of hemangiomas (Fig 269) They are soft bluish tumors usually small but may be of large

size They usually protrude above the surface of the skin but they may lie deep affecting the skin but slightly

Diagnosis—When superficial they are easily recognized but when they lie beneath the skin one is apt to think of the much more common lipomas The compressibility of the angioma should prevent the error

Treatment.—When small and superficial they may be destroyed by the cautery tied by several loops of ligature or excised The deep seated ones should be excised By operating carefully under novocaine adrenalin the vessels can be recognized before they are cut and clamped and ligated



Fig. 269—Hemangioma of the scapular region in a child aged fifteen months.

Lymphangiomas

Lymphangiomas are always situated near the axilla (Fig 270) They form soft pseudofluctuating tumors They do not disappear on compression

Diagnosis—They are softer than lipomas and are not compressible as are the hemangiomas.

Treatment—They must be excised a simple but tedious job Because babies bear the loss of blood badly the operation should be deferred until the child is four or five years old

Mycosis Fungoides

Mycosis fungoides is peculiarly an affection of the back. It begins as an induration beneath the skin like a slowly developing inflammatory induration. As it increases in size, the skin over it becomes red or reddish blue Soon other nodules develop in the region. Sooner or later these nodules destroy the skin and form ulcerous lesions (Fig 271) Following this nodules appear in the internal organs and the patient dies of exhaustion



Fig. 2 0 —Lymphangiomas of the subscapular region. Child aged two years.

Diagnosis —Before the stage of ulceration one must think of metastatic tumors and Hodgkin s disease of the skin. From the former the absence of a primary tumor and the presence of the discolored skin aids in the differentiation From the latter the differentiation depends on the discovery of Hodgkin s disease elsewhere In the final analysis it will likely be found that the line separating them is not very great

Treatment —When seen early much can be done to inhibit development by the industrious use of the x ray Once ulceration has developed nothing is of avail Arsenic may be given in the hope that the progress will be delayed by its use



Fig. [illegible] 1.—My [illegible] f [illegible] [illegible] [illegible] [illegible] undergoing ulceration. (Dr. [illegible] L. St[illegible]wart [illegible])



Fig. 212.—Epithelioma of twenty year [illegible]uration on th[illegible] back of a man aged [illegible]nty-thr[illegible] [illegible]rs. Not[illegible] th[illegible] t[illegible]ndency t[illegible] h[illegible]al at th[illegible] right-hand border

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Fig 270—Lymphangiomas of the subscapular r gion. Child aged two years.

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Fig. 271.—Mycosis fungoides. Some lesions [illegible] already undergoing ulceration. (Dr. L. L. Stewart [illegible].)

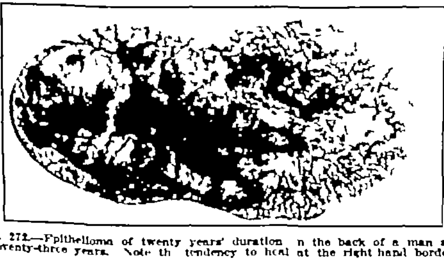


Fig. 272.—Epithelioma of twenty years' duration on the back of a man aged seventy-three years. Note the tendency to heal at the right hand border.

Mycosis Fungoides

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skin grafting is preferred by both the patient and the business office of the hospital

Syphilitic Ulcers

The back is a convenient blackboard for nature to use in labeling the syphilitic and in cases of suspected syphilis this region among others should be inspected for possible evidence. The lesions begin as nodules (Fig 274) in the skin which soon break down leaving reniform ulcers with soft overhanging borders. The shape of the lesion and the arrangement of the individual lesions to each other is the most characteristic object in

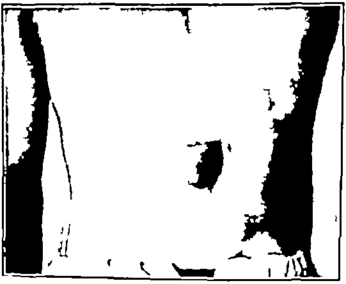


Fig. 274—Syphilitic nodule to the right of the midline in the lower dorsal region. This nodule afterwards broke down but promptly healed under mercurial treatment.

medicine (Fig 275). The lesions are reniform and the grouping of the several lesions in the aggregate is kidney shaped. Even when healed the scars remain indelible historical landmarks (Fig 276).

Diagnosis.—These ulcers resemble nothing else in the world. He who can think of any other lesion when viewing such pictures does not know syphilis.

Treatment.—Mercury and potassium iodide cause them to disappear in a few weeks. Then the patient must be treated. Mercury is more reliable than salvarsan.

Epitheliomas

The upper part of the back is often the site of a slowly growing superficial epithelial growth. They may be either spontaneous (Fig 272) or form on the basis of an old scar (Fig 273). These resemble like lesions about the clavicle. There is often a tendency to heal in certain situations.



Fig 273.—Epithelioma developing in a scar from a burn received in childhood

Diagnosis.—They differ from tuberculosis by the firm border and the absence of any tendency to undermine the edges.

Treatment.—The x ray is useful, but since these tumors are usually seen in individuals indifferent to personal hygiene and are also nearly always seen in the charity wards, excision and

skin grafting is preferred by both the patient and the business office of the hospital

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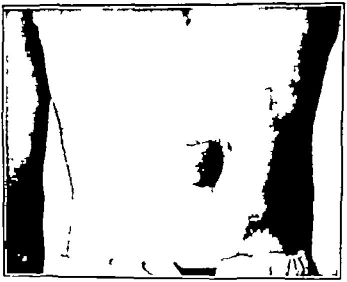


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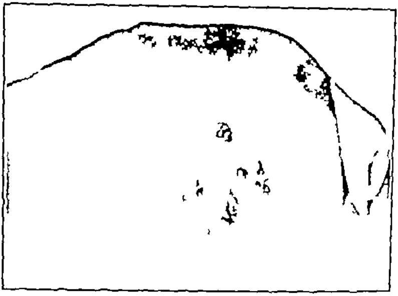


Fig. 2 5.—Gummatous ulcers in the region of the right lumbar region.



Fig. 2 6.—Healed syphilitic ulcers of the back.

MALDEVELOPMENT OF THE SPINE

The failure of the spinal canal to close gives rise to a number of disturbances, myeloceles, dermoids, and more extensive malformation, teratoid tumors.

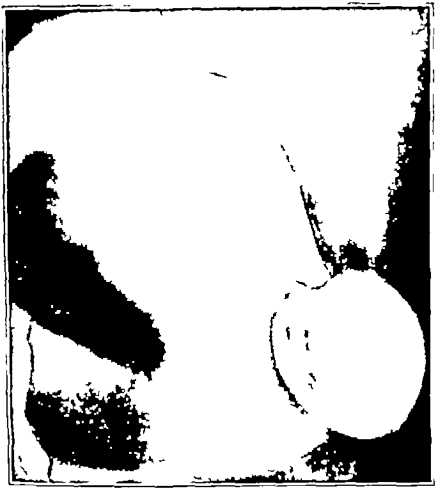


Fig. —Spina bifida of the sacral region.

Meningoceles and Myeloceles

Usually there appears a more or less prominent sac along the midline of the spine. It may involve the cervical region (Fig. 277), but the most common site is the dorsal (Fig. 278) or lumbar region, rarely the sacral region. In some cases the tumorous mass is covered for the most part with normal skin. Usually the tumor is covered in part by the normal skin, in part by a delicate

membrane like tissue (Fig 279) In other instances the whole tumor is covered by a thin membrane Sometimes the deformity is limited to the failure of the vertebral arches to close there being no protrusion. In such cases the x ray shows an absence of the arch and a marked widening of the canal. This may cause



Fig. 278.—Spina bifida in middorsal region.

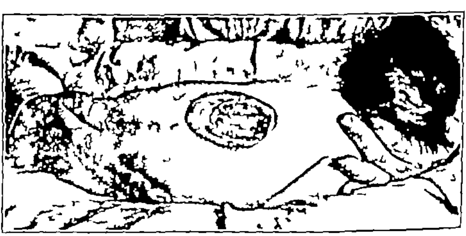


Fig 279—Spina bifida covered with a fine delicate membrane

a disturbance in the nerves coming off from the affected area This is likely to occur when the lumbar area is involved. There is a disturbance of the development an equinus being the com mon result A still lesser degree of development is seen in the sacral dermoids Here there is a failure of union of the skin

alone to unite There is a pocket of skin communicating with the exterior by a fine opening

Diagnosis —In a spina bifida it is necessary to determine whether the meninges alone are pouched or whether the cord likewise forms a part of the hernial contents If the membranes alone protrude there is no motor disturbance If the cord protrudes there may be When there is a complete covering of the skin the meninges alone are involved In the occult type where the arches alone are at fault there is no herniation at all

Treatment.—In the newborn the tumor mass must be protected by a soft sterile dressing This is particularly necessary when a rupture of the thin covering membrane and the fluid contents of the sac begin to escape for infection of the sac contents leads to a rapidly fatal meningitis The treatment consists in the removal of the herniated sacs If nerve elements are found in them these must be returned into the canal In the occult type when there is motor disturbance the cord may be freed so that the nerve function to the extremity is improved

Affections of the Spinal Column

Traumatic injuries and inflammations particularly tuberculosis and septic infections furnish the majority of the lesions but the possibility of metastatic tumors must always be kept in mind

Traumatic Affections

The traumatic affections may be due to direct or indirect injury Luxations of fractures with crushing of the arches of fracture with displacement causing pressure on the cord are the common results Such major lesions are usually apparent In minor injuries the extent of injury may not become apparent until later Any alleged injury to the spine therefore should be considered carefully

Diagnosis —A careful history with x ray examinations of the spine usually assures a fairly accurate diagnosis but even with this precaution grave lesions may develop in cases in which the primary examination fails to show a lesion

Treatment —When confronted by a probable spinal lesion immobilization is in order The patient must be transported on a

membrane like tissue (Fig 279) In other instances the tumor is covered by a thin membrane Sometimes the defe is limited to the failure of the vertebral arches to clo being no protrusion In such cases the x ray shows an of the arch and a marked widening of the canal This m



Fig. 278 —Spina bifida in middorsal region

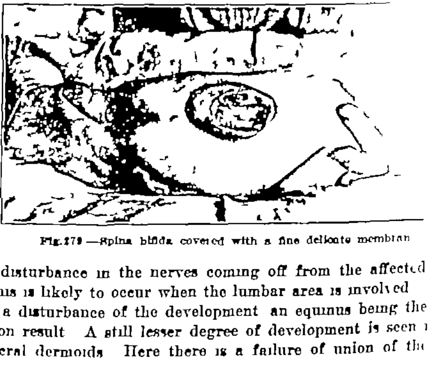


Fig. 279 —Spina bifida covered with a fine delicate membran

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Fig 80 —Tuberculous spondylitis ... dorsal vertebra ... displacement backward of the sixth

recognized as typhoid fever confusion is apt to result Disturbed bladder function and cramps in the legs may suggest myelitis. The x ray usually shows some bony changes and the severe pain on the slightest movement helps to exclude a primary cord lesion

Treatment.—Mobilization at the first suspicion of the disease is imperative A gas pipe bed frame is the best means early in the disease After the acute symptoms have subsided a plaster cast may be applied Recovery usually is complete in three to six months.

Chronic Spondylitis

Chronic inflammation between the vertebrae may be associated with rheumatism elsewhere or may follow an infection, notably tonsillitis, without the appearance of a rheumatic affection elsewhere The characteristic symptoms are pain and rigidity Later there may be ossification of the interrelated discs or lateral ligaments (Fig 281) fixing the joints or exostoses may form about the articular processes making every movement painful (Fig 282) When there is new bone formation the x ray will show their presence

Diagnosis.—Muscle inflammation may simulate this condition The limitation of motion is spasmodic and is relieved by counter irritation and appropriate medication aspirin salicylates. Early in the disease the x ray may show nothing Later bony formation about the borders of the vertebrae and in extreme cases a complete bony ankylosis may result.

Treatment.—In chronic spondylitis the source of infection should be sought and if found removed The tonsils and teeth are most often at fault The tonsils may be removed on suspicion, *but teeth should not be sacrificed unless abscesses about the roots* can be demonstrated Once the disease has become established and there is lipping of the articular processes or ossification between or about the vertebral bodies removal of the focus avails but little Generally speaking results are dependent on the duration of the disease. When long existent, particularly in middle life or beyond the clearing up of a focus avails but little

Myositis

Pain in the lumbar muscles the ubiquitous lumbago is one *of the commonest affections*. Frequently the history relates that the patient had been engaged at hard labor, often in the stooping position and after perspiring he became chilled. Perhaps the

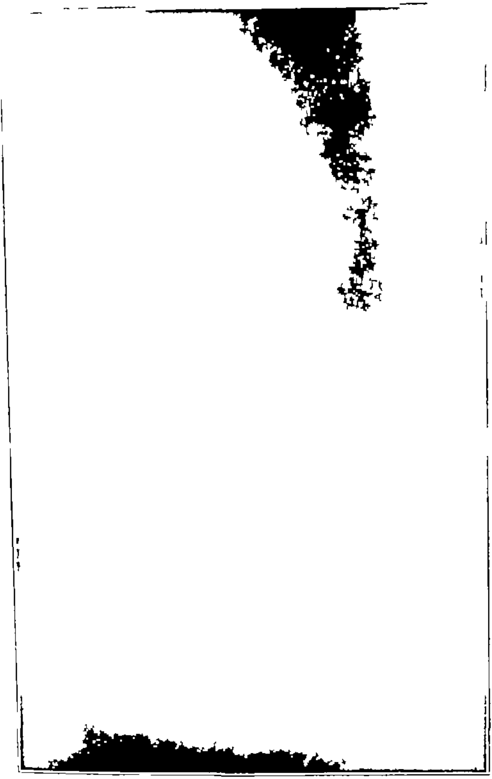


Fig. 281.—Chronic spondylitis. Note ossification of the lateral ligaments.

next morning while stooping to retrieve his trousers he feels a sudden sharp pain in his lower back which makes the assuming of an upright position exceedingly painful. In some cases the patient is confined to his bed, the slightest movement provoking severe pain Often the onset is less sudden There is pain on stooping and rising again. A common symptom is that the patient is wakened in the morning hours by a severe pain in the back. A change in position brings relief and allows him to go to sleep



Fig. 182.—Exostoses about the borders of the vertebrae and articular surfaces

again. On palpation there is more or less pain over the quadratus lumborum muscle particularly at the iliac insertion

Diagnosis.—*The history is pathognomonic however* spondylitis, rupture of the transverse processes, metastatic tumors, and spinal affections must always be thought of.

Treatment.—In the very severe cases a quarter of a grain of morphine should be injected into the substance of the muscle. Heat applied locally as hot as can be borne will prolong the relief

secured by the morphine If pain returns water should be injected at the second visit Less severe cases may be treated by the injection of a few drams of a 1 per cent of quinine and urea hydrochloride Internally potassium citrate in 20 grain doses with half as much salicylate of soda or moderate dose of belladonna or hyoscyamus aid recovery The patient should be warned against chilling after hard work lest the disease return

CHAPTER XIII

DISEASES OF THE ANAL REGION

The diseases of the anal region though simple viewed as pathologic entities because of the exceedingly sensitive tissues they involve, are of importance to the patient. Hemorrhoids, fissures, and fistulas furnish the everyday ailments, but tuberculosis, malignancy and proctitis, as well as rarer lesions, must be kept in mind

Hemorrhoids

The familiar 'pile'' is made up of dilated veins The dilatation in itself is not important but the thrombosis which leads to perivascular inflammation tends to hemorrhage and is productive of severe pain. A thrombosed pile the size of a pea engenders sufficient motive force to send a large man post haste to his doctor

According to the relation to the external sphincter hemorrhoids are divided into external and internal Each of these presents a different symptom complex and must be considered separately The two varieties may be combined however, producing a lesion beginning just within the internal sphincter and extending outward to include the perineal skin as a part of their covering

The external or cutaneous hemorrhoid is formed by a few dilated veins covered by a redundant tag of skin. Ordinarily these cause no disability but when they become irritated and a coagulum forms within the veins intense reaction follows attended by severe pain They present a reddish blue nodule about the size of a hazelnut (Fig 283) seldom much larger bluish red in color and tender to the touch

The internal variety (Fig 284) is composed of a bunch of submucous veins which have become varicosed. So long as they remain above the sphincter they cause little trouble The vessels may form coagula and cause pain or the surface may become eroded and bleeding may follow The chief source of trouble arises when they are forced within the grasp of the sphincter Thrombosis quickly follows with intense edema and severe pain

(Fig 285) If returned after protrusion before coagulation occurs no great disturbance may follow The same disturbance occurs if the coagula form first and the mass is extruded after

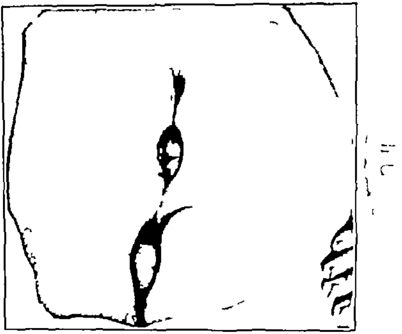


Fig. 283.—External pile The larger lobule to the left is the site of the thrombosis. The smaller mass is an edematous bag of skin.

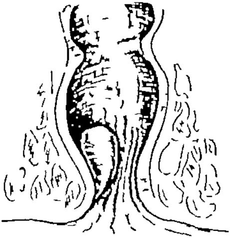


Fig. 284 —Position of internal hemorrhoids.

ward. The reaction beginning in the hemorrhoid extends to the adjacent skin Both hemorrhoid and surrounding skin become deep red or bluish red in color The stasis may become so intense that the mucosa covering the pile sloughs.

Diagnosis.—External hemorrhoids or the internal ones when they protrude can scarcely be mistaken for anything else. They may be induced or aggravated by antecedent or associated conditions, however. A prostatitis or proctitis of any variety may excite them to activity, and being discovered the possibility of the preliminary condition may be lost sight of. Simple as the diagnosis is, errors are not uncommon. Pain on defecation with bloody stool is insufficient for the diagnosis. Carcinomas are



Fig. 285.—Prolapsed internal hemorrhoids. The greater part of the masses is made up of edematous perivascular tissue.

often overlooked because of this assumption until they progress beyond the period when cure is possible. Tuberculosis may cause similar symptoms. Therefore the presence of hemorrhoids should never be assumed, but their presence always definitely demonstrated. This is not always easy. The thrombosed cutaneous variety may be easily seen but the internal when not inflamed may not be readily palpated. This is particularly true of the small bleeding type. The examining finger placed just within the sphincter is swept about the circumference of the rectum.

Usually soft protrusions may be detected If they are of long standing some type of speculum of the bivalve or windowed variety should be used The spherical proctoscopes are not suitable because when the lip is withdrawn to the region of the sphincter this contracts and forces the instrument out before a view can be obtained

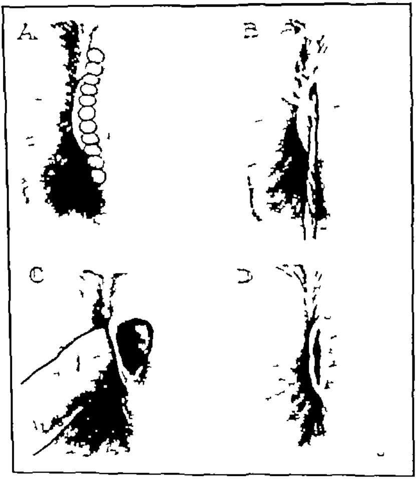


Fig. 286.—Treatment of cutaneous hemorrhoids. *A*, The skin over the pile is infiltrated with novocaine. *B* The clot is exposed with a small electric cautery *C* The clot is pressed out with the finger The wound, *D* is allowed to granulate.

Treatment.—As palliative treatment hot compresses give relief. Ointments or suppositories containing belladonna or opium are of service in the internal variety Bleeding piles are sometimes benefited by suppositories containing tannic acid Definite cure by operation should always be advised.

In the small cutaneous hemorrhoid incision under local anesthesia with knife or cautery and the turning out of the clot cures the lesion If incision is made with a scalpel bleeding may be sufficient to require a suture to control it The suture should be removed after the danger of hemorrhage is past say in twenty four hours When incised by the cautery no suture is required

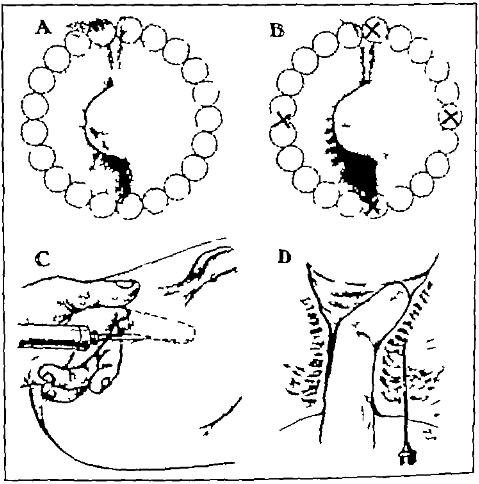


Fig. 287 —Operation for internal hemorrhoids *A* A line is infiltrated about the anus. *B* At four points the deep injection is made With a finger as a guide, *C* the needle is passed between the gut wall and the sphincter

and the patient may go about his business at once The technic is as follows The skin over the hemorrhoid is infiltrated (Fig 286 *A*) and then the overlying skin is cut through with a small electrocautery (Fig 286 *B*) The clot is then turned out by pressure or with the aid of an instrument (Fig 286 *C*) The folds of the skin are then allowed to fall together (Fig 286-*D*) without

sutures or packing. If the skin about the hemorrhoid has become much inflamed it is better to make the infiltration in the healthy skin about it and beneath it instead of over the surface of the highly sensitive tumor. When large it is best to dissect out the mass of veins containing the clot.

The *internal variety* is best cured by ligation and excision or by destruction of the redundant portion by the clamp and cautery.



Fig. 88.—The needle is shown passed to the proper depth to infiltrate the external sphincter muscle.

The technic is as follows. Beginning at a convenient point a line is infiltrated with novocaine-epinephrin (Fig. 287 *A*). From several points in this line (Fig. 287 *B*) a needle is passed between the mucosa and external sphincter using the finger as a guide (Fig. 287 *C*). If extensive operations are to be done or if there is marked spasm of the sphincter the sphincter should be infiltrated (Fig. 288). In making this deep injection a needle at least 2½

inches long should be used A finger in the rectum serves as a guide to prevent the needle entering the lumen of the bowel. After infiltration has been done in this manner, the sphincter relaxes at once, for the sphincter reflex is excited by the irritation of the nerve endings in the anal region The hemorrhoids may then be drawn down and ligated according to the follow

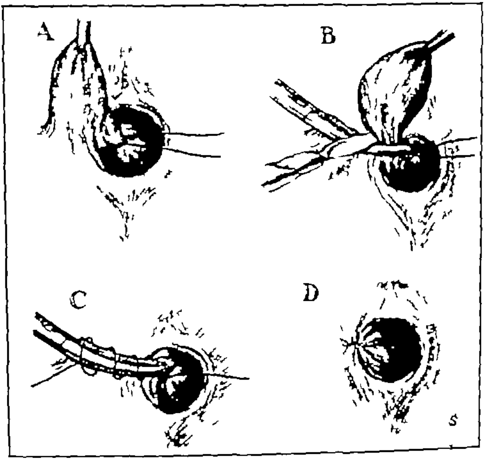


Fig. 289—Excision of internal hemorrhoids. *A* The hemorrhoid is drawn down by means of forceps and the pedicle is ligated high up. This secures the main blood supply *B* The hemorrhoid is grasped by a stout forceps and the hemorrhoid is excised. *C* A suture is whipped about the forceps and the forceps are withdrawn. The tying of this suture *D* constricts the pedicle and controls the bleeding.

ing technic The hemorrhoid is drawn down by means of a forceps. It is grasped at its base by a *second forceps and the pedicle* is ligated (Fig 289-*A*) This ligature should pass down but not through the rectal musculature This secures the chief arterial supply The redundant portion is then cut off (Fig 289-*B*) and

the pedicle is then secured by suturing through it, passing each time over the clamp (Fig. 289 C). The forceps are then removed and the suture is tied (Fig. 289 D). This over-and-over suture is sufficient to obliterate the veins and superficial arteries and to reduce the length of the wound. Better still the redundant portion may be destroyed with a cautery. In this technic the pile is grasped as in the preceding and a ligature is placed about its pedicle (Fig. 290-A). Instead of cutting the redundant portion as in the preceding it is destroyed by the cautery (Fig. 290-B).

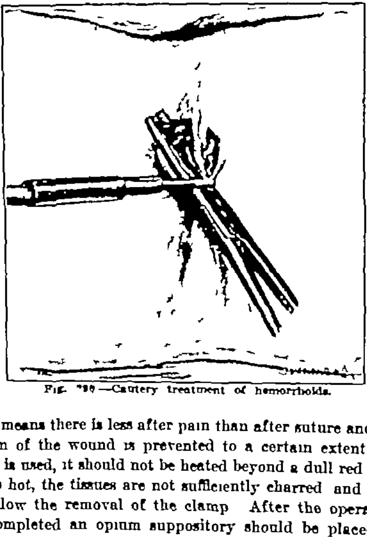


Fig. 290.—Cautery treatment of hemorrhoids.

By this means there is less after pain than after suture and usually infection of the wound is prevented to a certain extent. If the cautery is used, it should not be heated beyond a dull red heat. If it is too hot, the tissues are not sufficiently charred and bleeding will follow the removal of the clamp. After the operation has been completed an opium suppository should be placed in the rectum to control the after pain. A rubber tube placed in the anus aids the expulsion of gas, and if not too large does not cause irritation of the wound.

Perirectal Abscess

Infections of the ischiorectal fat leads to abscesses which may bulge into the perineum or into the rectum (Fig 291) They follow injury of the rectal mucosa from ulceration or from a foreign body as from a blow on the perineum. If allowed to pursue their course they may extend above the levator ani for considerable distances, rupture into the rectum or through the skin of the perineum or they may do any two or all three of these. There results then some form of fistula Before rupture they produce great pain with more or less constitutional reaction. The pain is throbbing and burning in type Because of their size they may interfere with bowel movements and may cause urinary retention either reflexly or by direct pressure



Fig. 291—Location of perirectal abscesses. A A. Below the levator ani muscle and lateral to the external sphincter B Abscess above the levator ani muscle. C C Cross section of the external sphincter muscl

Diagnosis.—Usually there is evident induration of the skin of the perineum on one or both sides Only in late cases is the skin red or is there fluctuation. Rectal examination will show bulging within the rectum or at least induration of the perirectal tissue which is exceedingly sensitive on pressure When the origin of the abscess is high up the perineal infiltration may be absent. In such cases rectal examination alone must be depended upon. Abscesses extending downward from the tubes or broad ligament even from the appendix as well as prostatic abscesses may simulate perineal abscesses. In fact pararectal abscesses may be terminal stages of such infections. Caries of the pelvic bones likewise may cause infection of the ischiorectal space In such cases the history of onset materially aids the physical examination in making a diagnosis Dermoids of the sacrum may ap-

proach the ischiorectal fossa and simulate abscesses They are always in the midline differing thus from ischiorectal abscesses

Treatment.—Palliative measures, such as rectal suppositories ice bags or hot packs to the perineum should be used only until such a time as operative treatment can be instituted Fluctuation should not be awaited If there is induration incision should be proceeded with at once If a general anesthetic is available, this is preferable but local anesthesia may be used An incision at least an inch long should be made in a line radiating outward from the anus and far enough lateralward not to endanger the sphincter An incision beginning an inch from the anus and extending lateralward an inch is applicable to most cases. If the abscess reaches nearly to the median raphe posteriorly the fossa on the opposite side should be incised also for it will almost surely become infected secondarily and require drainage within a few days. Gauze drainage should be used after the space is explored with the finger after incision Rectal fistulas nearly always follow perirectal abscess and patients should be informed of this and be given to understand that a secondary operation will be required for its cure

Fistula in Ano

As a result of an incision or from spontaneous rupture of an ischiorectal abscess as above described an external opening is produced which tends to remain permanently The resulting communication from the skin to the lumen of the gut remains as a permanent fistula (Fig 292 *A*) In rare instances the abscess breaks into the lumen of the bowel forming a fistula with only an opening within the gut and a blind fistula is the result (Fig 292 *D*) A fistula opening may form into the intestine at some point below the upper limit of the abscess. There results then a blind fistula extending above the point of opening into the intestine (Fig 292-*C*) Theoretically the opening in the intestine may close, leaving only an external opening a blind external fistula (Fig 292 *B*) It is doubtful whether there is such a thing If the opening into the bowel were to close the fistula would likely heal, a termination seldom realized The course from the intestinal lesion to the skin is not always a direct one The pus may burrow

almost completely around the rectum (Fig 293 *A*) Almost any conceivable combination may result by the burrowing from the original point (Fig 293 *B*, *C*, *D*) There may be one of several openings and even several independent tracts. The external opening may close spontaneously only to rupture again at some other point. In this way several external openings may form. Sometimes the opening of the intestine is just below the skin and superficial fascia, external to the external sphincter and sometimes is 3 4 or even 5 inches or more from the external sphincter When the

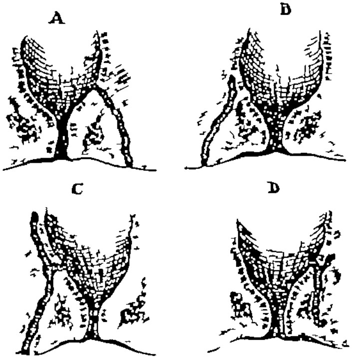


Fig. 293.—Schematic presentation of the common types of perianal fistulas. *A*. Complete. *B* Blind external. *C* Fistula extending beyond the point of opening into the gut. *D* Blind internal.

fistula is draining the patient is free from pain and is annoyed only by the discharge. If the opening closes, pain begins and lasts until the fistula again discharges Each of these exacerbations presents the symptoms above enumerated for ischiorectal abscesses.

Diagnosis.—The presence of a fistula is usually obvious from the history of ischiorectal abscess Its extent and direction must be determined by exploration with a probe This is exceedingly difficult in complicated cases. It is best, therefore to first anes

thetize the area involved or the entire patient, as may be elected, and then proceed with exploration and operation Fistulas may occur in the perianal region from abscesses of other regions Pelvic abscesses from puerperal infection and infections of the prostatic urethra from appendicitis or bone diseases may form abscesses that point in the region in question The history aids us here Tuberculous abscesses may form and secure an external outlet.

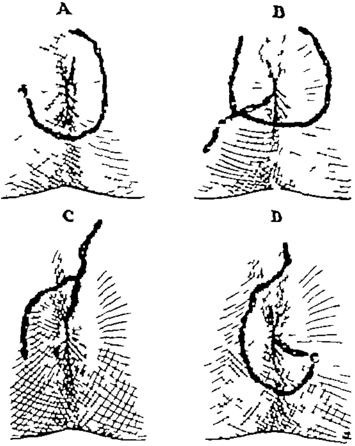


Fig. 191.—Diagrammatic representation of some of the commoner complications of fistulae. *A*. The anus is nearly circumscribed by the tract. *B* In addition there is a blind tract leading into the perirectal space. *C* Half horseshoe with a blind tract leading into the perineum. *D* Horseshoe with blind tract to the perineal region.

Treatment.—When a fistula becomes closed and a perianal abscess forms it should be drained by incision as in primary ischiorectal abscess. A simple incision under local anesthesia is sufficient if done early No attempt should be made at this time to cure the fistula After the discharge has continued until the

fistula develops a fibrous tissue wall, cure of the fistula may be undertaken The classical method is to pass a grooved director in the external opening along the fistulous tract into the lumen of the bowel (*A*, Fig 294) through the inner opening, and then the end of the probe (*B*, Fig 294) is pulled out of the anus carrying (*C*, Fig 294) the intervening tissue with it This tis-

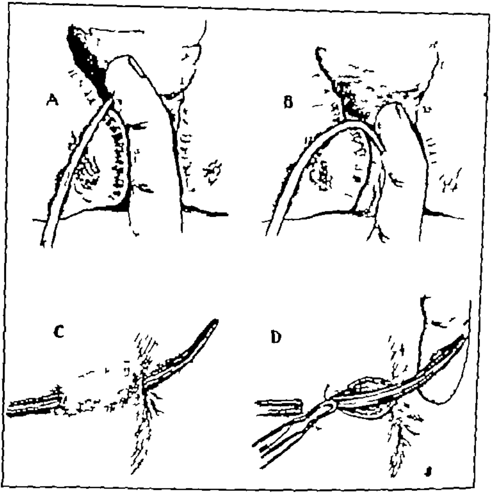


Fig. 294 —Incision of perirectal fistula *A* A grooved director is passed along the fistulous tract and is guided through the rectal opening by the aid of a finger *B* The director is bent and is guided out of the anus, so that *C* the intervening tissue is pulled downward *D* The tissue is cut through by means of an electric cautery

sue is then divided with a knife or cautery (*D* Fig 294) This leaves a large triangular opening bounded on one side by the fistulous tract medially by the intestinal mucosa and the base of the skin. This cavity is packed with gauze and allowed to heal by granulation This method is effective in simple fistulas,

but a number of weeks are required for the healing process to be complete In those cases in which the fistulous tract circumscribes the anus this method is not suited because of the enormous wound that results The better way is to dissect out the tract following it in all its ramifications and then closing the

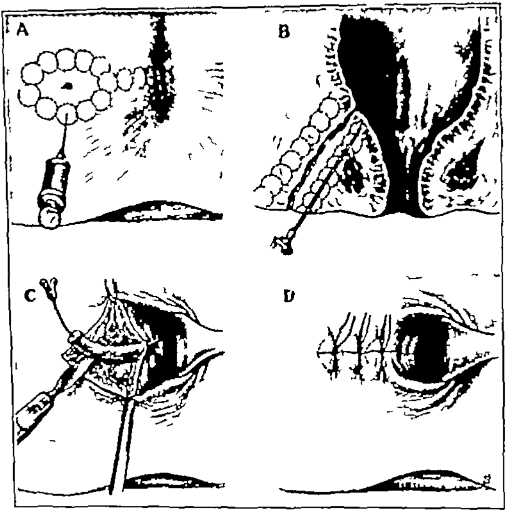


FIG. 295.—Excision of fistula in ano. *A* Infiltration in the skin about the opening and in the line of the tract. *B* Infiltration along the line of the fistula. *C* Excision of the fistula. *D* Closure of the defect by suture.

wound with sutures. The technic is as follows A line is first infiltrated about the anus as described in the operation for hemorrhoids and the anal sphincter is infiltrated and the sphincter well dilated The fistulous tract is then infiltrated by circumscribing the fistulous opening (*A*, Fig 295) and then extending

a line in the direction of the fistula (*B*, Fig 295) The entire tract is thus surrounded by infiltration of the anesthetic. A grooved director is passed through the tract and the fistulous tract is dissected out using the director as a guide (*C*, Fig 295) The tract should be removed as an intact tube If inadvertently cut into, infection will be invited. It may be well to inject the tract with tincture of iodine before the operation is begun if the operator is not sure of his skill in removing it intact. If the opening in the gut is high up the cut edges must be grasped by forceps lest they slip beyond reach and bleeding points cause embarrassment The tract being removed and all accessory tracts attended to in a like manner, closure of the wound is begun by suturing first the incision in the intestine. Interrupted sutures of catgut are used and as the intestine is closed, it is allowed to retract into its normal position The deeper portion of the wound is closed by buried catgut sutures after which silkworm gut sutures are used to close the skin (*D*, Fig 295)

The rectum is lightly packed with gauze to protect the line of suture as much as possible The bowels are kept locked with opium for four days and are then moved by a combined laxative and enema

A number of difficulties may be encountered in this operation The accessory tracts may be difficult to find Usually they extend about the anus horseshoe fashion between the sphincter and skin. If the internal opening cannot be found, great care must be exercised to find the highest point of the tract before opening is made into the intestine When accessory sinuses are present it may be necessary to stop the operation to permit renewal of the infiltration There may be a temptation for the operator to abbreviate the operation if the sinus goes beyond his primary estimate of the extent of the disease. It is better, therefore if the extent of the disease is not clearly discernible before the operation to make a sacral blocking at the beginning or to use general anesthesia

Sacral Dermoids (Pilonidal Cysts)

This common affection is caused by inclusion of dermal tissue over the terminal portion of the sacrum They usually cause trouble in early adult life by becoming infected Intense in

flammation with induration occurs in the sacrococcygeal region and sooner or later a discharging sinus appears This is nearly always located in the midline near the base of the coccyx During the interval between periods of exacerbation the patient is

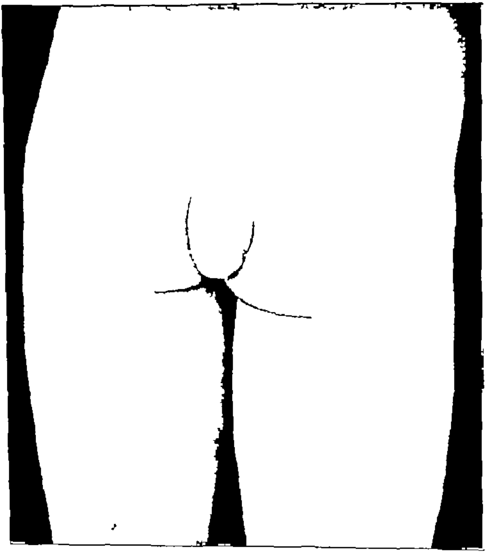


Fig. 296.—Sacral dermoid.

free from pain Usually there is but a small sinus leading to the pilonidal area In rarer instances a veritable protruding cyst is present (Fig 296)

Diagnosis.—The location of the pain and induration over the sacrum differentiates this affection from ischiorectal abscess.

After a sinus forms this is in the midline while perirectal infections form fistulous openings any place except in the midline. When explored with a probe the channel will be found to extend upward over the surface of the sacrum very rarely in front of the coccyx to the interior of the pelvis. Occasionally long hairs protrude from the sinus. This is pathognomonic. After incision hairs are usually found Occasionally other tumors are found in this region notably lipomas (Fig 297)



Fig 29 —Lipoma in the perianal region.

Treatment.—The infected skin lined pouch must be excised. After extensive infiltration with novocaine the entire lumen of the cavity is excised. This must be followed upward and downward until all the area has been removed This exposes the periosteum of the sacrum Such wounds almost certainly will be infected during the course of the operation and should, therefore be only partly closed by suture and the remainder loosely packed with gauze Healing takes place in from four to six weeks.

Tuberculosis of the Anal Region

Tuberculosis of the anal region is an uncommon affection but when misjudged and mistreated it leads to distressing consequences It begins usually as an ulcerous process in the mucosa and may remain as such but perianal infection may involve the surrounding tissue which in time may perforate the skin producing a fistula The ulcerous process may follow the mucosa



Fig. 298 —Tuberculous ulcer of the anal margin.

and affect the perianal skin The typical lesion is a flat sluggish granulating ulcer often with soft overhanging borders (Fig 298) The process is slow to develop, seldom acutely painful and there is little tendency to heal When the perianal tissue becomes involved a fistula usually develops without producing pain The opening is soft and there is little tendency to form scar tissue. Instead of a fibrous tract being formed the skin may be undermined for some distance (Fig 299) The ulcers are deep red sluggish and soft and may show a tendency to

undermine the surrounding skin. While the ordinary fistula tends to select the stout and the corpulent individual, the tuberculous fistula occurs most commonly in the thin person, most often in those who are affected with tuberculosis elsewhere

Diagnosis.—When the ulcer is superficial it must be differentiated from carcinoma, this is easy because of the soft overhanging edges, a carcinoma has hard rolled-out edges which bleed readily (Fig 300) When the perianal tissue is long involved there may be an abundance of scar tissue which may

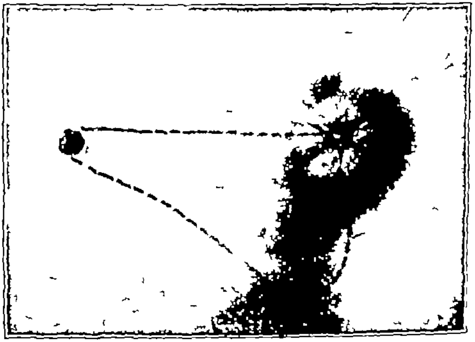


Fig. [illegible]—Tuberculous perirectal fistula. The dotted line shows the extent of the undermining of the tract.

simulate the hardness of carcinoma. When a fistula forms, the slow onset is suggestive but the characteristic factor is that instead of having thick scarred walls, the fistula is large and is covered by indolent granulation tissue

Treatment.—The energetic use of the cautery is in order if the patient is in good health. In the emaciated or in those in whom there is definite pulmonary tuberculosis it is best to ignore the local lesion and treat the patient as any other subject of tuberculosis. After the general health is restored the local management of the fistula may be undertaken Often the local lesion

heals spontaneously as the general health is restored If injudiciously operated on, large, ugly wounds may form which long annoy the patient and embarrass the operator If operated on at all, the excision must be wide of the lesion as in operation on malignant conditions



Fig. 100.—Carcinoma of the rectal mucosa. The border of the ulcer is rolled out. Note the heavy rolled-out edges of the ulcer

Syphilis of the Anus

Primary lesions and tertiary ulcers are sometimes found here The primary lesions are characterized by the same signs as those

occurring elsewhere The tertiary lesions are characterized by their rapid onset with a maximum degree of pain

Diagnosis—When syphilis is suspected, other signs must be sought for and the laboratory should render substantial aid.

Treatment—The usual treatment of this disease should prove the diagnosis by the rapid disappearance of the symptoms.

Prolapsus Ani

Occasionally particularly in children the whole rectal wall protrudes from the anus (Fig 301) It appears as a soft corrugated mass extending in extreme cases several inches beyond



Fig. 301—Prolapsus of the rectum in an adult.

the anus Usually the child is below par physically and is always constipated Aside from the protrusion there may be no local discomfort In the slighter cases the protruding bowel returns spontaneously after defecation but in most cases it must be returned by manual manipulation In the adult the mucosa may alone protrude simulating then an extensive hemorrhoid The entire rectal wall may protrude

Diagnosis—The diagnosis is simple The extent of the protrusion and the general physical state of the patient must be

determined in children and in adults the relation to the bowel as a whole must be considered A protruding intussusception has been mistaken for rectal prolapse an impossible mistake if the general disturbance be kept in mind

Treatment—In children the general treatment of the patient with attention to the bowels will result in spontaneous recovery in one to three years In adults the redundant bowel may be excised or the intestine retained within the pelvis by fixation through an abdominal incision

Fissure

These aggravating little lesions are nothing more than cracks in the mucosa just below the mucocutaneous junction They often show little induration and no tendency to heal They cause pain and sometimes bleed occasionally severely Often the irritation from the fissure irritates the sphincter to spasmodic contraction which intensifies the pain and provokes the fissure to renewed irritation

Diagnosis—They are easily recognized when they can be brought to view It is often difficult to separate the parts so that they can be seen

Treatment.—The best treatment is excision The cautery, electrical or actual is usually effective but the healing process is slower than after excision Dilatation of the sphincter should be done so that healing may take place without being subjected to the compression of the spasmodic contractures of the muscle

Pruritus Ani

This annoying affection is characterized objectively by a thickening a whitening and a corrugation of the perianal skin and subjectively by intense itching The lesion extends on the mucosa to a point over the internal sphincter and over the skin for an inch or more about the anus, being most intense near the mucocutaneous junction The lesion sometimes extends up the gluteal folds, up the scrotum or vulva as far as the symphysis. The itching is usually most intense when the victim becomes heated

Diagnosis—The thickened skin, the white color and the history of intense itching are characteristic One had best remember that occasionally a discharge from the vulva or anus may cause an itching In such cases the skin is reddened and indurated but not white and corrugated.

Treatment—Temporary relief may be obtained by local applications as calamine lotion *with phenol. Prolonged relief can be* obtained by applying pure carbolic acid for 30 seconds and then neutralizing it with alcohol. More efficient is the intracutaneous injection of a 1 per cent solution of quinine and urea hydrochloride A line is injected about the periphery of the lesion From this line spoke like lines are injected con

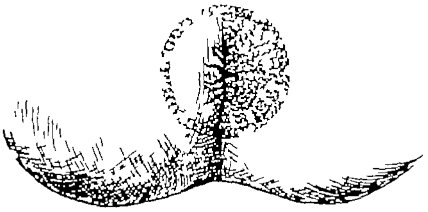


Fig 302.—Quinine injection in pruritus ani.

verging at the terminus of the lesion at the anal mucosa (Fig 302) These lines must be so close together that the entire skin is infiltrated The injection must be endermic *Subdermic* injection is not nearly so effective Quinine when injected too rapidly causes intense smarting for a moment. The injection must be done carefully with a sharp thin needle Just enough fluid must be injected to produce a wheal If this rule is observed there is no danger of sloughing This frequently produces a permanent cure Those cases which are complicated by hemorrhoids should have these removed.

In most cases palliation is insufficient and operative treatment must be resorted to The most effective measure is the removal of the affected skin After anesthetization with novocaine the area affected is circumscribed by an incision (*A* Fig 303)

When the affected area is removed it is sewed to the mucosa (*B* Fig 303) It is best first to treat one side and then the other (*C* Fig 303) This prevents annoying retraction of the

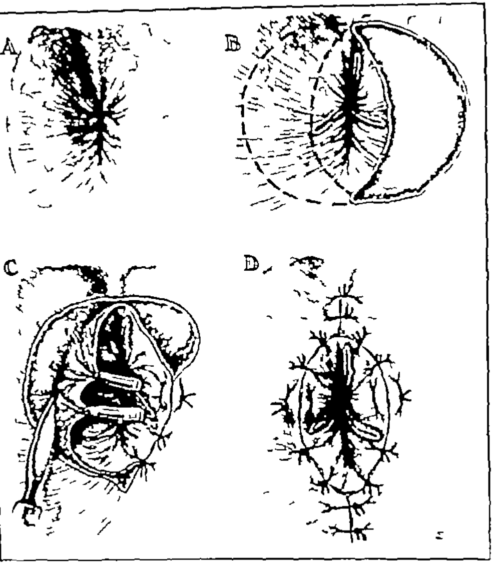


Fig. 303—Excision in pruritus ani. *A*. The area of involvement is shown by the puckered, wrinkled skin. *B* The involved area excised is shown on the right of the picture. *C*. This defect has been closed by suture and the left half is in the process of being cut away *D* The operation completed.

anal mucosa. After the operation has been completed there should be close coaptation between the skin and mucosa Merely undermining the skin sometimes is effective but it is not so sure of a permanent cure as excision.

CHAPTER XIV

DISEASES OF THE MALE GENITALS

The affections of the male genitalia are not numerous or very important but because of the prominent part they play in civilization, they require frequent and careful attention The prepuce stands second to the tonsils as objects of surgical attack, only because of the nature of things there are fewer of them varicosities and hydroceles are little more than of mechanical interest Malignancies are rare and a kind providence has assigned the venereal infections to the dermatologist rather than to the surgeon thereby manifesting a fine appreciation of the fitness of things.

AFFECTIONS OF THE PREPUCE

Phimosis the condition in which the opening is so small that the foreskin cannot be retracted, allowing the accumulation of irritating excretions beneath it, and paraphimosis that condition in which the foreskin can be retracted but cannot be returned to its normal position comprise the surgical diseases of the prepuce

Phimosis may be so extreme that but a pinpoint opening is left for the passage of urine Usually the opening does not interfere with urination but with hygiene only (Fig 306) When the retention of secretions is long continued the prepuce is thickened and corrugated (Fig 307) In old patients long the subject of phimosis who suddenly begin to have irritation, the possibility of malignancy must be considered (Fig 308)

Paraphimosis is brought about by the retraction of a foreskin, the opening of which is too small to permit its being replaced. The constriction quickly brings about a characteristic edema (Fig 309) When there has been a long standing irritation, malignancy may develop This can be distinguished by the irregular hard granulations and the tendency to bleed in malignant cases In some cases there is a cauliflower like development which is easy to recognize as malignancy

Diagnosis.—The diagnosis of phimosis and paraphimosis is made at a glance. Whether or not circumcision is demanded in the absence of these is somewhat a matter of individual opinion.

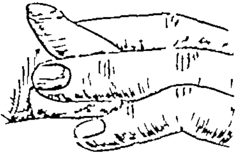


Fig. 306.—Phimosis in a young boy.

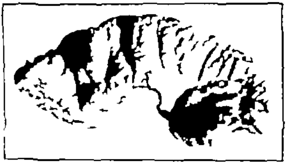


Fig. 307.—Corrugated prepuce due to retained secretions in phimosis.



Fig. 308.—Squamous-celled epithelioma of the glans discovered after a phimosis was split.

If there is much secretion or irritation unquestionably the operation should be done. When the glans is unduly moist the operation is likewise indicated. Finally it may be stated that the

prepuce is a wholly unnecessary appendage and there is no valid objection to its removal

Treatment.—In both phimosis and paraphimosis as well as in simple redundancy, the operation is much the same In adolescents and adults local anesthesia is to be preferred The steps are as follows The foreskin is allowed to fall in its natural position A line of skin is infiltrated just over the glans (*A* Fig 310) The skin is then retracted and the inner layer is infiltrated (*B* Fig 310) Since the frenulum is very sensitive *it is well to inject this separately* (*C* Fig 310) In cases of phimosis when the retraction cannot be done a short wait will secure anesthesia through the first skin infiltration. When the anesthesia is complete the opening is grasped by two forceps and the foreskin is slit to within a fourth of an inch of the corona in adults (*D*, Fig 310) and half that distance in children (It is said the glans has been split by a blade of the scissors inadvertently passed into the urethra) The redundant skin is then trimmed off with scissors (*E* Fig 310), leaving enough of the inner layer to permit easy suturing (*F*, Fig 310) There is usually free bleeding about the frenulum and the bleeding points must be separately ligated or caught in the suture A strip of gauze containing a little vaseline wide enough to cover the suture line is all the dressing needed Adults should take 30 or 40 grains of sodium bromide at bedtime for the first few nights to prevent painful erections In paraphimosis the retracted skin is cut with scissors after infiltration with novocaine (Fig 309) Circumcision may then follow

Papilloma of the Prepuce

This harmless affection sometimes brings the patient pell mell to the doctor They usually consist of a row of villiform warts the size of a grain of wheat or a little larger (Fig 311) They are soft and the surface from which they arise is not inflamed or infiltrated

Diagnosis—Their soft structure and uninvolved base makes it impossible to confuse them with any other lesion

Treatment.—They are readily clipped off with a scissors under local anesthesia

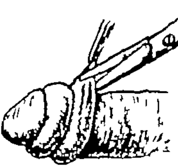


Fig. 309.—Paraphimosis. The retracted foreskin is edematous. The position of the scissors shows the point at which the constriction is cut.

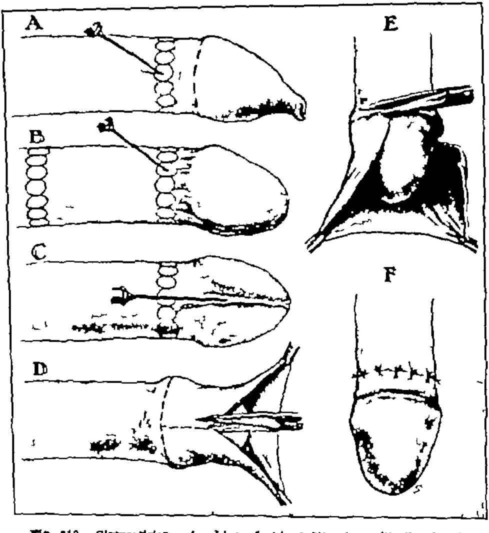


Fig. 310.—Circumcision. *A.* Line of skin infiltration with the foreskin in normal position. *B.* The *inner layer is infiltrated* after retraction. *C.* The frenulum is infiltrated separately. *D* and *E.* The redundant skin is cut off just below the level of the glans. *F.* When sutured the line of union falls above the glans.

Induration of the Penis

Induration of the penis is an affection of middle or later life. The patient first notices that erection is imperfect and there is a tendency of the glans to bury itself into the abdominal wall.



Fig 311—Benign papillomas of the prepuce.

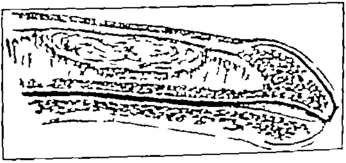


Fig. 312—Chronic induration of the penis.

There is no pain but sometimes there is marked nervous depression amounting even to melancholia On examination a hard cartilaginous body is felt in the dorsum of the penis (Fig 312) It is usually an inch or more long and a third as wide The width usually exceeds the thickness. The body is painless, un

attached to the skin but is firmly united with the corpora cavernosa

Diagnosis—It resembles no other disease It differs from inflammatory troubles by the history and from tumors by the fact that no tumor occurs in this situation They have been operated upon under the diagnosis of fibrosarcoma Sarcomas do not occur in this region

Treatment.—These lesions have been dissected out without results The x ray has been equally ineffective but it may give the patient some satisfaction to try this form of treatment

Malformations

Aside from the pronounced deformities, which have no practical interest the failure of the development of the urethra is the most frequent When the urethra fails to close an hypospadias results. When there is a defect above it is an epispadias. This deformity when it extends to the bladder forms an extrophy of the bladder The opening of the urethra in hypospadium may be anywhere from the normal situation in the glans to the perineum. Usually the opening is small.

Diagnosis.—The discovery of the urethral opening is sufficient to make the diagnosis, save one must keep in mind the possibility of a double urethra.

Treatment.—If the opening is insufficient to permit the proper flow of urine it may be enlarged by incision If the opening is just below the glans it is well to let good enough alone If further back, an attempt to form a new urethra should be made—the most aggravating and unsuccessful operation in surgery

Retention of the Urine

Inability to spontaneously void urine is caused usually by stricture or enlarged prostate The history and the age of the patient usually give a clue to which of these is present. Actual proof is supplied by the use of the sound. In stricture the occlusion lies somewhere between the glans and the triangular urethra, usually in the membranous portion. The obstruction due to prostatic enlargement is, of course in the prostate

Diagnosis—Simple as the diagnosis is, *the possibility of retention being of neural origin*, must always be kept in mind and an examination of the nervous system must always precede treatment. Rare causes, such as tumor or valve formation, may be here disregarded.

Treatment.—In stricture the opening is usually so small at the time the patient presents himself for treatment that no catheter can be passed There remains then but to secure passage by means of filiform bougies. One of these is first passed then a second and a third and a fourth After this a small sound may be passed A sound which may be attached to a filiform bougie is convenient but is seldom at hand. Once a small sound has been passed those of successively larger size may be passed until a canal of normal size is secured. After this sounding should be done every month or two to prevent recontraction of the scar

The passage of the sound is an operation requiring delicacy of touch and some knowledge of the anatomy of the urinary tract. The utmost gentleness is required The weight of the sound should supply the motive force the fingers of the operator doing but little more than to act as a guide No one appreciates fully how easy it is to force a false passage until he has encountered this error If bleeding is caused undue traumatism has been inflicted

The passage of the sound may be divided into four acts the sound is passed through the meatus when the penis is directed upward (*A* Fig 313) The tip of the sound passes to the base of the corpora cavernosa in this position. The sound is then raised while the finger placed below the corpora cavernosa guides it into the membranous urethra (*B*, Fig 313) The sound is then brought to a horizontal position and the tip is guided into the prostatic urethra (*C*, Fig 313) Sometimes lifting the sound slightly aids in passing this obstruction. If the tip successfully passes through the prostatic urethra the guiding hand *feels a tendency of the sound to lower to* a horizontal position. This tendency is encouraged until the tip of the sound finds its way into the bladder (*D*, Fig 313)

When retention is caused by an enlarged prostate the catheter is resorted to at once At first a soft one of moderate size, say

18 French is used If this fails one of smaller or larger size may be used Failing with the soft catheter a webbed one armed with a wire stylet may be tried The wire may be so bent that a larger curve may be formed or a short sharp curve *near the tip* enables the catheter to be elevated over the middle lobe which is usually the offending object Sometimes withdrawing the wire a short distance lifts the tip of the catheter over the obstruction *Once the tip* has entered the bladder, the wire is entirely with

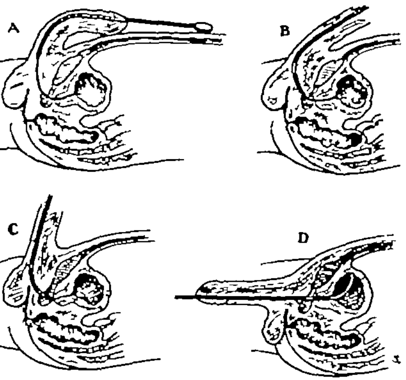


Fig. 313—The passage of the sound. *A* The sound is introduced when the penis is parallel with the surface of the abdominal wall. *B* It is guided until the trigon is reached. *C* The sound is brought to the vertical position to pass this point. *D* When the tip has passed this point, the sound is lowered to the horizontal position.

drawn permitting the urine to flow out Metal catheters should not be used except by those trained in the passage of the catheter If great trouble has been experienced in passing the catheter it may be allowed *to remain in position for some* hours or days

Sometimes when there is difficulty in passing the catheter a few drams of adrenalin solution of 15 minims of adrenalin to 4 drams of water injected into the deeper urethra may so deplete the tissues that the catheter readily passes.

If the effort to enter the passage through the natural channel fails, an artificial opening must be made The point of election is immediately above the symphysis pubis below the point of reflection of the peritoneum. A small trocar or a large aspirating needle may be used The entrance of the needle into the bladder is easily perceived both by the operator and the patient. The urine may then be allowed to flow away or aspiration may be done according to the size of instrument used This procedure may be repeated at intervals as needed until steps can be taken to secure permanent relief

Diseases of the Scrotum and Its Contents

Varicoceles and hydroceles are the most common affections, with diseases of the testicle the most important. Of these mixed tumors syphilis and tuberculosis dominate

Disease of the Skin

Many small wens are sometimes found in the scrotum (Fig 314) Save for slight annoyance, they are of no consequence. They may be readily shelled out Pruritus of the scrotum is usually an extension from the anal region and will be considered under that head Epitheliomas are occasionally observed. They are slow growing and are cured by local excision. The redundant skin in this region makes wide resection easy

Varicocele

Dilatation of the pampiniform plexus is a common affection of early adult life. It is commonly ascribed to some injury, but this likely has little to do with their development. Usually the left side alone is affected. The veins are dilated to the size of a slate pencil or larger and the feeling to the touch is likened to a handful of angle worms Frequently there is a feeling of pulling on the scrotum or along the cord and often a backache is complained of The chief mischief they do is to furnish a cause for introspection at an impressionable age They frequently disappear spontaneously or the patient ceases to regard them as of consequence. Carrying a crying baby at night seems to be a specific Occasionally however an atrophy of the tes-

ticle develops and a definite neuralgic pain develops This state is usually seen in single men of middle age

Diagnosis.—Varicocele is easily recognized When the left side is markedly affected the right side may be somewhat involved If the right side is chiefly or alone involved one is very apt to find a tumor of the right kidney When the pampiniform

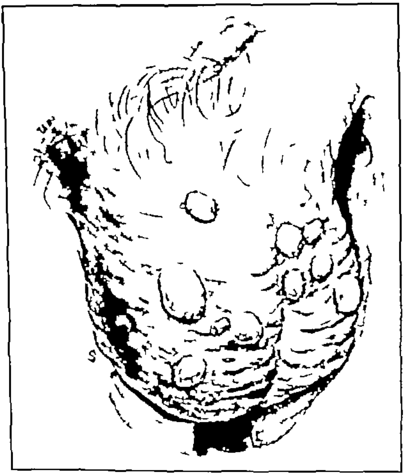


Fig. 314.—Veins of scrotum.

plexus is much affected for many years the cutaneous veins of the scrotum may become widely dilated. This condition must be differentiated from cavernous angiomas of the scrotum (Fig 315)

Treatment—Sometimes the wearing of a suspensory and a little reassurance will relieve the patient particularly if he is planning to marry If the varicocele is large and the patient complains much operation may be performed. If the patient

is matured the operation should be performed If he complains of lancinating pains or if the testicle is atrophied, the patient should be told that these conditions likely will not be relieved by operation. The operation has two objects to fulfill, the removal of the offending veins and a shortening of the scrotal sac in order that the testicle may receive support The technic is as follows A line is infiltrated over the cord just external to the



Fig 315 —Venous angioma of the skin of the scrotum.

external abdominal ring The cord is then grasped by the thumb and index finger and the needle is passed into the cord (*A*, Fig 316) The skin and fascial layers are then incised exposing the cord. The vas and a few small veins are then isolated and preserved from injury The veins to be removed are then ligated above and below (*B* Fig 316) The portion of the veins between the two ligations is then cut away and the two cut ends are brought together (*C* Fig 316) The fascia is then sewn together so that the longitudinal incision becomes transverse (*D*

Fig 316) In this way the scrotum is shortened to a degree equal to the length of the incision in the fascia The skin is then united in a longitudinal line (*E*, Fig 316)

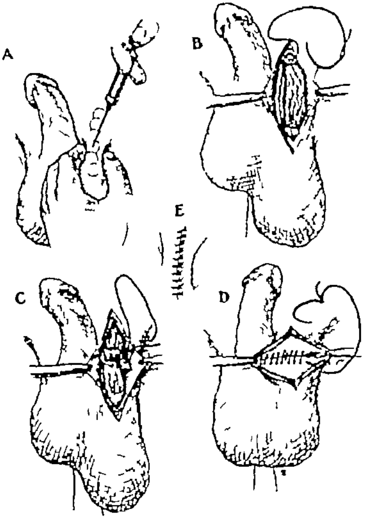


Fig 316.—Operation for varicocele. *A*. After a line of skin has been infiltrated, the cord is grasped and infiltrated. *B* The cord is isolated and the redundant veins ligated. *C* After the veins have been removed, the severed ends are united. *D* The fascia is united in a transverse line, and, *E* the skin in a longitudinal line.

Hydrocele

A collection of fluid within the tunica vaginalis may occur spontaneously or as a result of a trauma In children it may be associated with an opening in the peritoneal cavity The disability is wholly that of bulk. They may attain enormous dimensions but as usually observed they vary in size from that of a hen egg (Fig 317) to that of an ostrich egg They are egg

shaped smooth elastic, and painless They are easily recognized by the manner in which they transmit light The simplest procedure is to press a small electric light bulb as of an opthalmoscope, against the skin In the absence of such an instrument any light may be used and viewed through a tube made from a roll of paper Instead of the entire tunica vaginalis being affected only small segments may be involved Globular masses about the size of a hickory nut or walnut are found anywhere along the cord. *These also may be demonstrated by transmitted*

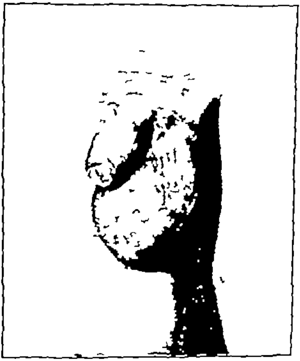


Fig. 317—Small hydrocele of the left side.

light Smaller cysts in contact with the epididymis may represent a dilatation of a tubule and contain spermatozoa—a spermatocele

Diagnosis.—A hydrocele is easily recognized by the methods indicated The possibility of a concealed lesion must be kept in mind A malignant tumor or an inflammatory lesion of the testicle may have as a symptom a serous exudate It is well worth while therefore to study by means of transmitted light the size and form of the testicle Solid tumors of the testicle may have the form of a hydrocele but they do not transmit light

Treatment.—Hydrocele in children may be allowed to go unmolested since they usually disappear spontaneously If large enough to bother either the patient or the parent they may be cured by operation In the adult they always require operation. Puncture by means of a trocar gives but temporary relief and the attempt to cure by injecting an irritating substance is wholly unjustified It is slow, painful and uncertain Radical cure is secured by injecting a line of skin and blocking the cord as in the operation for varicocele just described The sac may then be exposed and carefully trimmed away from the cord and testicle Careful hemostasis is required and a temporary drain is advisable lest hemorrhage into the sac occur and a hematoma the size of the hydrocele develop

Hematocele

Occasionally spontaneously but usually following a trauma blood collects within the tunica vaginalis. Occasionally a vessel is injured in tapping a hydrocele and the sac fills with blood. Whatever the cause of the hemorrhage the scrotum rapidly enlarges and becomes painful Usually the size is not large as in hydrocele it is egg shaped (Fig 318) hot and tender to the touch.

Diagnosis.—The history of the onset and the absence of translucence distinguishes it from hydrocele The rapid onset and tenderness differentiates it from tumors

Treatment.—Unless the hematocele is large expectant treatment suspension, rest in bed, cold applications or solutions of lead acetate may be applied When the hematoma is large as one following unskillful puncture of a hydrocele sac, drainage should be done. A sufficient opening must be made so that all the clots may be removed. In old hematoceles the tunica vaginalis becomes so thickened that it must be excised.

Mixed Tumors of the Testicle

Nearly all the solid tumors of the testicle belong to this group They are most common in early adult life. They appear as small nodules within the testicle or on its surface, particularly protruding into the epididymis. They may however be as big as a

goose egg when they first present themselves, being perhaps passed on as a hydrocele. When small the surface is usually irregular but when large it may be perfectly smooth and egg shaped. There may be an accompanying hydrocele which completely masks the tumor When exposed at operation they may show small cysts and degenerated areas

Diagnosis—The diagnosis is not easy When small and nodular they must be distinguished from tuberculosis When large



FIG. 318—Hematocele of the left side following traumatism.

they resemble syphilis. Tuberculous affections begin in the epididymis and may have an attachment to the skin or even form a sinus Usually the teratoid tumors are but a single nodule while the tuberculous affection involves the whole structure Too often the testicular neoplasm is diagnosed by finding lymph nodules in the retroperitoneal or supraclavicular lymph glands.

Treatment.—Teratoid tumors when no metastasis can be found can be removed and should be removed together with as much cord as possible The removal of retroperitoneal lymph glands is hardly justified because these patients all die and castration is

justified only to give relief from the local conditions Massive doses of x rays have been extensively used on the metastatic nodules with the result as so generally happens in the heavy doses of x rays, that the tumor improved but the patient died

Gumma of the Testicle

Gumma of the testicle usually involves the body of the testicle rarely the epididymis. There is a rather rapid enlargement, generally with but little pain Usually the enlargement is smooth seldom attended by hydrocele The lesion is often bilateral

Diagnosis.—When the epididymis is involved it must be differentiated from tuberculosis. The enlargement is smoother than tuberculosis and develops more rapidly Within the testicle it must be distinguished from mixed tumor When the history dates back a year or more mixed tumor is suggested In many cases the use of potassium iodide for a few weeks is worth more than clinical reasoning Syphilis usually responds to this drug

Treatment.—The treatment is that of syphilis Usually the local lesions disappear quickly

Tuberculosis

Tuberculosis involves primarily the epididymis It is frequently associated with like disease of the seminal vesicles, bladder or kidneys Which is first affected is often a matter of speculation. At first the epididymis is firm and irregular Later it may break down at certain points and give rise to fluctuation. The skin may be involved in the reaction and later on sinuses may develop

Diagnosis—As previously stated gumma when it occurs in the epididymis, must be differentiated from tuberculosis. Confusion can occur only in the beginning After softening occurs and sinuses are formed, the diagnosis is easy In the beginning gumma invades only one part while tuberculosis invades the greater portion of the epididymis Finally one may search for further evidence of tuberculosis and syphilis.

Treatment.—Generally speaking general hygienic care may be depended upon. Under no circumstances should there be an

attempt made to excise the local lesion This is too apt to provoke a general miliary tuberculosis to make it a justifiable procedure If operation is to be undertaken the entire extent of the disease must be determined and the entire infected area removed—a very difficult and formidable operation in extensive cases

Infective Epididymis

Involvement of the epididymis is a common complication of gonorrhea, less often of prostatitis or prostatectomy Usually the onset is sudden often with fever always with marked tenderness and edema The exudate may form a tumor as large as a small orange Unless the exudate is very excessive the epididymis can be palpated and noted to be much enlarged Sometimes lymphadenitis of the lymph gland lying over the pelvic brim may simulate appendicitis When the condition becomes chronic it may form a thickening of the entire epididymis without evident acute reaction

Diagnosis—The acutely infected epididymis is characteristic enough. When chronic it must be differentiated from tuberculous epididymitis which is usually easy enough by its sudden onset and the absence of fistula formation Abscess may form which differs from the softening of tuberculosis by the history of the onset and the greater tenderness

Treatment.—Acute epididymitis should be treated by rest in bed and elevation of the scrotum and the constant application of a lead acetate compress. When abscess forms it must be drained.

Irritable Testis

Sometimes the testicle becomes exceedingly sensitive to pressure Even light pressure of the clothing may initiate lightning like pains comparable in intensity to those of tic douloureux. The pain may begin in the testicle or cord and shoot up or down. It sometimes comes on spontaneously but more often follows a trauma or an operation for varicocele or hernia and is due to the imprisonment of a nerve in the operative scar

Diagnosis.—In some instances of chronic epididymitis lightning like pains may occur, but here there is a demonstrable lesion and the pain is less likely to be lancinating

Treatment.—If a lesion of the epididymis can be demonstrated, it may be removed or drained In those instances in which there is no anatomic lesion castration is the only remedy

CHAPTER XV

DISEASES OF THE FEMALE GENITAL ORGANS

The *minor ailments to which the genitals of females are subject* are those incidental to reproduction the inflammatory and the neoplastic

VULVA

The vulva presents a variety of lesions peculiar to this region. The inflammatory and neoplastic are uncommonly closely related

Cysts of the Vulva

The ubiquitous cysts of the Bartholin glands occur just within the caruncula myrtiformes and appear as ovoid deep-seated tumors The surface of the cysts lies just below the mucosa but is unattached to it There is usually a history of a preceding *inflammation of these glands*

Diagnosis—They must be differentiated from lipomas of the labia minora They are more deeply seated and are tense elastic while lipomas are softer boggy and semifluctuating The chief point, however is that the cyst occupies the site of Bartholin gland which lipomas never do being situated higher up and above and within the labia

Treatment.—These cysts must be dissected out this can readily be done under local anesthesia The chief feeding artery is above and lateral to the cyst and unless it is grasped before it is cut, it retracts and some trouble may be encountered in securing it

Cysts of the Canal of Nuck

The terminal portion of the round ligament may *be invested* by peritoneum This when filled with fluid gives rise to a cyst which lies within the labium majoris

It must be differentiated from tumors of the round ligament

This is usually easy because it differs from the solid tumors in that it is tense and elastic

They are readily removed under local anesthesia Care should be taken to secure the end of the ligament in the canal if the entire inguinal canal is open as in a regular operation for inguinal hernia

Vaginal Cysts

Small vaginal cysts are quite common They appear as small globular tumors, usually as large as a pea or a hazelnut They

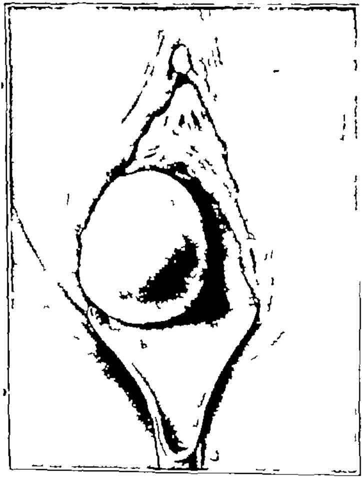


Fig. 319 —Cyst of the vagina.

are particularly common about old perineal tears Larger vaginal cysts up to the size of a goose egg (Fig 319) are rare They are usually located on the lateral vaginal wall and as they grow

in size they protrude from the vulva They are tense elastic and may be much compressed As they are pressed upon the upper pole becomes distended and tense The papillary type grows more rapidly

Diagnosis—They are distinguished from vulvar cysts by careful consideration of their deeper portion particularly when pressed upon They can be distinguished from perineal hernias (Fig 320) by the fact that they are irreducible

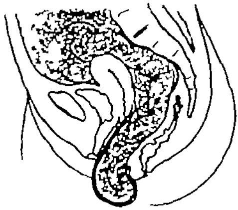


Fig 320—Hernia in the perineum.

Treatment.—The small vaginal cysts require no treatment The larger ones sometimes extend much further up the vagina than appears at first, making their removal difficult. Unless the operator is expert in the use of local anesthesia ether had best be used By drawing on the partly enucleated cyst one can secure the upper portion

Lipomas

Lipomas usually occur in the labia majora (*Fig 321*) as ovoid tumors which are smooth semifluctuating and unattached to the skin. Rarely are they found in the labia minora

Diagnosis—They must be differentiated from cysts When they lie high toward the symphysis they resemble cysts of the canal of Nuck and when they lie deep toward the labia minora they may be confused with cysts of the Bartholin glands or even with vaginal cysts. Lipomas are boggy, *semifluctuating* while cysts are tense elastic

Treatment.—Lipomas are easily shelled out. There are no accessory lobulations in the lipomas in this situation

Epitheliomas

Epitheliomas of the vulva usually occur about the labia minora and about the clitoris They appear as superficial ulcerations with hard indurated borders (Fig. 322) They are usually quite painful Carcinomas of the urethral orifice are by no means uncommon They present a hard surface and bleed easily



Fig. 3 1.—Lipoma of the labium majus.

Diagnosis.—Epitheliomas of the vulva must be differentiated from tuberculous ulcers and chancres Tuberculous ulcers have soft borders, the patient is usually young and the pain is usually severe chancres are indurated areas with little ulceration and are less painful there is frequently inguinal adenopathy with chancres. Carcinoma of the urethral orifice must be distinguished from urethral caruncles Long duration and soft velvety feel speak for caruncle while hardness and evidence of recent exacerbation speak for malignancy

Treatment.—Epithelial ulcers should be excised, preferably with the cautery. They are usually superficial and the prognosis is relatively good.

Tuberculosis

Superficial ulcers with soft undermined borders very sensitive to the touch, are frequently seen about the vulva. They are usually regarded as tuberculous, but this diagnosis often cannot be proved.



Fig. 33.—Epithelioma of the clitoris.

Diagnosis.—These ulcers are softer than epitheliomas and usually occur in young women whose general health is much below par.

Treatment.—The patient's general health requires attention. Syrup of the iodide of iron, good food and air are the chief measures. Local treatment by cautery or the application of trichloracetic acid often hastens recovery.

Vulvitis

Nonspecific acute vulvitis is often observed in newly married women. It may occur whenever there is any irritating discharge. It is attended by intense reddening, often swelling, and some discharge. Chronic vulvitis is usually associated with chronic endocervicitis. The skin is often much thickened.

Diagnosis.—Vulvitis must be distinguished from specific infection and from irritating lesions associated with constitutional disorders, notably diabetes.

Treatment.—Acute nonspecific vulvitis is readily relieved by a drying powder and by keeping the irritated parts from contact by a pledget of cotton. The chronic form can be relieved only by the removal of the cause. When the cervix is at fault a repair of the tear, if there is one, or the destruction of the cervical glands by the cautery usually results in a cure. In some cases nothing short of a hysterectomy will bring relief.

Varicosities of the Vulva

Sometimes in conjunction with, more often independent of, varicosities of the legs, the vulva is involved in extensive varicosities. The dilated veins may form masses the size of a lemon or larger. In the nonparous state they are nothing more than an inconvenience, but in the pregnant state they may increase rapidly and in labor they may rupture and in the puerperium thromboses may form. Rupture during labor may produce a very alarming state. When the vaginal orifice is extensively involved the vein mass may serve as an actual impediment to the advancement of the presenting parts. When thromboses form pain and reaction of the surrounding parts may be pronounced.

Diagnosis.—The deep blue color and the compressibility make diagnosis simple. An effort must be made to determine whether the condition is a local one or whether it is a part of a more extensive process.

Treatment.—In the nonpregnant state they should be removed by operation. By beginning at the periphery and identifying vessels and ligating them before cutting them, one can remove the mass without difficulty. If rupture occurs during labor

compression can be used as a temporary measure, but mass ligation of the point of rupture as soon as materials can be prepared should be done. When thrombosis occurs hot packs with lead acetate give the most relief

Pruritus Vulvae

This affection is characterized by a blanching thickening and corrugation of the skin which may occur spontaneously or may be associated with a chronic vulvitis caused by endocervicitis or diabetes. The corrugation of the skin and the thickening are at once evident on palpation It is usually most intense in the labial folds but may extend over the whole vulva and even over the mons thighs and perineum.

Diagnosis—The disorder is unmistakable but a possible etiologic source always must be sought and if found it must be removed Careful examination of the urine always must be made and the cervix must be examined for possible inflammation or discharge In some instances there is no associated lesion This type is found most often in nervous individuals

Treatment—Usually temporary relief can be secured by topical applications containing phenol such as the calamine solution with phenol More permanent relief is obtained by the subcutaneous injection of quinine and urea hydrochloride as described for pruritus ani In very intractable cases the areas most affected must be excised and the less affected areas undermined by incision In nervous individuals bromides often are effective

DISEASES OF THE CERVIX

The great problem in diseases of the cervix is to differentiate the so called erosions and a beginning malignancy

Erosions of the Cervix

When lacerations of the cervix occur the mucosa is allowed to become everted exposing the red mucosa which appears in marked contrast to the pinker surface of the cervix Erosions of the cervix may be attended by discharge backache headache and general malaise These symptoms are due largely to

displacement and the metritis so often associated The reddened surface is often interrupted by whitish, shot like bodies which are small cysts formed by occlusion of the cervical glands The line of demarcation between the red and pink areas is a sharp one (Fig 323) The surface is soft and does not tend to bleed

Diagnosis—The softness of the surface, the little tendency to bleed and the sharp line of demarcation distinguish the lesion from malignancy The rare villiform malignancies are soft and velvety and tend to bleed on manipulation Tuberculous and syphilitic ulcers are undermined soft and dirty looking

Treatment.—Since the cervical erosion is usually due to lacerations of the cervix it is by the repair of the laceration that the



Fig. 323—Erosion of the cervix with polypoid degeneration of the mucosa of the cervical canal.

erosion is eradicated In elderly women trichloracetic acid and the actual cautery may be used The latter is particularly to be recommended in the cervical erosions attending prolapsus of the uterus or pruritus vulvae after the menopause

Cervical Polyps

Mucous polyps usually have their point of origin at or near the internal os (Fig 324) They grow downward as elongated pear-shaped masses that may protrude through the vulva. They are deep red soft and edematous They may bleed profusely but otherwise they present no symptoms unless they protrude from the vulva

Diagnosis.—They must be differentiated from submucous fibroma which protrudes from the cervix (Fig 325) These are more globular and are firmer than the polyps and often when in the state of beginning gangrene, they are a deep blue or black. The differentiation is not difficult but it is important, for an

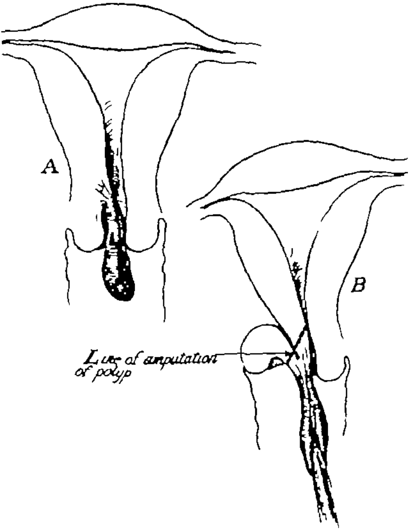


Fig 324.—Cervical polyp A Point of origin at the internal os. B Showing how the uterus may be inverted by traction.

extruded gangrenous submucous fibroid is a dangerous condition and excision should always be by cautery lest an open wound become infected.

Treatment—The polyps may be snared off at their base or better still cut off with an electrocautery or chemical cautery

The uterine wall may be inadvertently everted if too much traction is made on large polyps.

Carcinoma of the Cervix

It is only rarely that carcinoma of the cervix is seen in its early stages. It is only when it is so far advanced that hemorrhage or pain is produced that medical advice is sought. The line of demarcation between the eroded area and the cervix is an irregular one (Fig. 326) and gradually shades from the one to

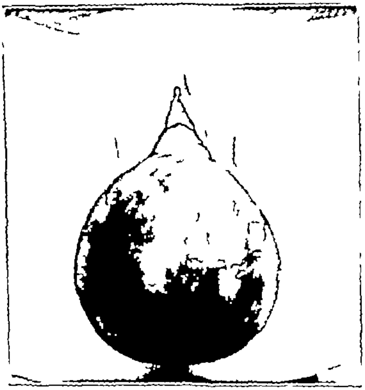


Fig. 325.—Submucous myoma protruding from the vulva.

the other. It lacks the sharp line of demarcation which characterizes erosion. Malignancy usually involves one part of the cervical circumference more than the other instead of extending uniformly about the whole circumference. The surface is hard and granular and it bleeds readily on touch or manipulation. The soft velvety form (Fig. 327) likewise bleeds easily on manipulation. The type that begins within the canal may not be noticed until the base of the broad ligament is indurated.

Diagnosis—The lesion in its early stages shows a reddened granular surface resembling granulated eyelids The dividing line between the reddened area and the pink color of the surface is not a sharp one The surface is hard granular and tends easily to bleed on manipulation. The hardness and tendency to bleed are characteristic Cysts in erosions may simulate to touch the hard nodules of carcinoma Inspection shows the cysts to be



Fig. 326—Nodular masses in the lower part of the figure are due to an early carcinoma.



Fig. 327—Early carcinoma of the cervix. The origin is in the mucosa of the cervix.

bluish and puncture allows the thickened mucus to escape thus rendering the final proof of their innocent nature

Treatment—When these lesions are seen early hysterectomy is indicated A few patients are permanently cured by operation. When the uterus is freely movable hysterectomy is to be recommended When the disease extends beyond the cervix operation is useless Palliative measures—radium the cautery or acetone—are then to be used

CHAPTER XXI

INJURIES TO THE UPPER EXTREMITIES

Wounds of the upper extremities furnish the most frequent object requiring the attention of those engaged in the practice of minor surgery. Often insignificant in themselves at the beginning they become matters of vast importance if neglected or improperly managed. It is of great importance therefore that each injury no matter how insignificant, be accorded careful attention.

Contusions

Under the term contusion is considered those injuries in which the surface is little or not at all injured and the chief disturbance occurs in the subcutaneous tissues. Contusions of the upper extremities may occur at any point but probably occur with greatest frequency in the hands and fingers as a result of blows or pinching or friction. They may be accompanied by abrasion or hematomas or both (Fig. 328). Often the presence of hemorrhage into the tissues does not become apparent until later.

Diagnosis.—Usually the patient brings the history of injury this together with the presence of localized pain redness and swelling is sufficient to make the diagnosis. Fracture of bones near the contused area or injury to important deeper structures must be ruled out. Since fractures cannot always be excluded by palpation it is desirable to have x ray pictures of all save the most minor contusions. Often the degree of injury to deeper structures cannot be made out soon after the injury, such as contusions to nerves synovial bursae etc. It is desirable therefore to reserve an opinion when the possibility of such injuries is present.

Treatment.—When seen early ice water compresses applied for a few hours or the application of ice caps help to limit the exudate and in many instances obviate the necessity of further treatment. Later the application of heat in the form of hot water compresses,

hastens the absorption of the exudate. The old fashioned lead acetate solution a dram to the pint, used as a compress, limits the exudate and with it the pain

Abrasion

An abrasion is the traumatic removal of a portion of the skin. In less elegant but quite expressive language the patient speaks of having 'skinned his finger' Abrasions may occur at any point subjected to blows, pinching or violent scraping against a rough object. The regions of the joints most frequently suffer As a result of the injury serum exudes from the surface and if the wound is slightly deeper, blood oozes from injured capil

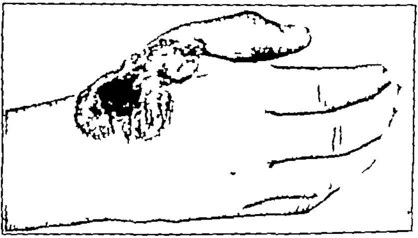


Fig. 328 —Contusion of the hand. A hematoma has been formed in the center

laries. The pain due to the injury of the nerve endings is often quite severe Quite as often the patient is unconscious of injury until he notes his blood-smeared finger

Diagnosis.—The blood and serum oozing from the injured surface makes the diagnosis obvious One needs, however to raise the question of other more important injuries.

Treatment.—Since abrasions are frequently the portal of entry of infection the surrounding skin should be scrubbed with soap and water and the wounds treated with tincture of iodine If the affected part can be kept quiet and the abrasion is not too large it should be exposed to air without dressing after painting with tincture of iodine This allows the exudate to dry and form a crust An abrasion treated in this manner will heal

much more rapidly than when dressed with an ointment. If the injured area be large or on a much exposed part, it is necessary to use a dressing of plain gauze after covering the wound with an aseptic powder or rubber protective

Hematoma

In most contusions there is some escape of blood into the tissues but it is only when the amount reaches such an extent that it is easily discernible to the naked eye that we can speak of hematoma They are the result of blunt injury of sufficient degree to rupture a vessel They may be diffuse or localized

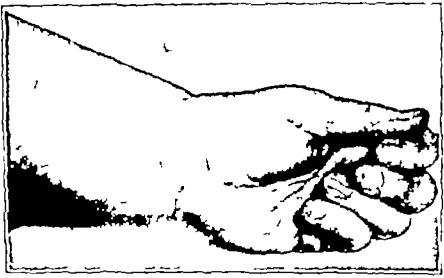


Fig. 329 —Hematoma of the flexor surface of the wrist.

forming a definite tumor such as subperiosteal or subungual hematomas or diffuse extending through the tissues without definite limitation, as in injuries of the muscle (Fig 329) Localized hematomas usually occur in a part if a covering is detached from underlying vascular tissue as where periosteum is detached from bone or the nail from its bed etc. Diffuse hematomas follow contusions about joints, sprain, muscle rupture dislocation and fracture The symptoms of a diffuse hematoma are at first those of contusion namely pain swelling and redness. Later the infiltration of the tissues by the blood reaches the surface and discolors the skin Those of a localized hematoma are contusion attended by the rapid formation of a tumor

When the hematoma forms rapidly, the tension on the surrounding tissue causes severe pain This is particularly true of the subperiosteal hematomas. In loose tissues the pain is less in the beginning and becomes progressively more severe as the surrounding uninjured tissues suffer irritation by the blood clot.

Diagnosis.—A diffuse hematoma is diagnosed by the discoloration of the skin following a contusion The skin is at first red from the infiltrated blood later almost black, and after a few days it changes to a greenish yellow A rapidly forming localized tumor immediately following a contusion is practically always a hematoma The tumor fluctuates at first and then becomes solid as the clot forms. Later when the clot liquefies the center of the mass fluctuates while the outer edges become firmer

Treatment.—When the patient is seen shortly after the receipt of the injury, before the hemorrhage has ceased a bandage should be firmly applied to aid in checking it. If the hemorrhage is localized, a pad should be placed over the growing tumor and a bandage applied firmly over this The bandage should not interfere with circulation in the extremity and the patient should be kept under observation lest the swelling increase and unduly tighten the bandage This treatment is important when the injury involves a joint particularly the wrist or elbow In a diffuse slowly developing ecchymosis this treatment is less applicable These hematomas disappear spontaneously Gentle massage of the part may expedite the process and lessen the disability Small hematomas readily become absorbed and require no further treatment. Hematomas in joints or tendon sheaths should be treated expectantly

Large localized hematomas should be cut down upon after all hemorrhage has ceased Strict asepsis should be observed It is well to allow several days to intervene between the forming of the hematoma and the drainage of it. The reaction of the surrounding tissue to the clot will lessen the danger of infection and will mitigate the consequences should infection take place The incision may be small A small rolled sheet of rubber or rubber tube drain should be left in the cavity occupied by the clot to drain off serum and small clots that liquefy A compress should be placed over the wound and held with a small bandage

to obliterate the cavity occupied by the clot. Aspiration of the clot after liquefaction, as is sometimes practiced, is not advisable since it requires several punctures and each aspiration subjects the wound to infection.

The management of subungual hematoma requires a special word. When the clot is small, all that is necessary is to drill a hole through the nail to relieve the tension. This may be done with the point of a knife. When the clot occupies the whole under surface of the nail and loosens the root, the whole nail should be removed at once. After the digit has been anesthetized by novocaine, a sharp knife should be inserted under the distal end of the nail and the nail cut loose by keeping the knife close to its under surface. After half of it is removed, the distal end may be grasped with a hemostat and rolled back. The wound then should be dressed with sterile gauze until the nail bed dries after which no dressing is necessary. Strict asepsis should be used in this operation. The nail grows out in two to three months.

Blisters

Blisters are collections of serum under the epidermis, usually in the palm of the hand, but they may occur on any surface as a result of long-continued friction in one spot. They are frequently painful and may become infected.

Blood Blisters

Blood blisters are small localized hematomas which develop just beneath the skin. They are caused by pinching or a severe blow. They differ from ordinary blisters only in that blood instead of serum escapes. They are treated in the same way. They are not painful after once fully formed. The only pain they cause is from the initial trauma and from the distention of tissue during the course of formation. Their definite borders are sufficient to distinguish them from other blood extravasations.

Treatment.—Blisters should never be opened widely exposing the tender dermis to the air. They should not be opened for twenty four hours, after which time the soreness has mostly disappeared. The skin over and around them should then be

painted with tincture of iodine and the blister should be punctured with a sterile needle The needle should be inserted at the extreme edge of the blister, or better still in the unaffected skin about $\frac{1}{10}$ of an inch from the edge of the blister, entering it from the side This tends to prevent infection After the fluid is evacuated a compress held in place by a snug bandage should be applied The raised skin should be allowed to come away of itself

Wounds

Wounds of the hand are frequent and because of their constant use in manipulating utensils are usually potentially infected The proximity of important nerves, vessels and tendons gives them a decided importance over less highly organized parts of the body It is convenient to separate wounds of the hand into the simple incised the lacerated and the crushed These may be further divided according to the tissue injured Though not essentially different injury by certain agents such as gunshot or puncture may be separately considered

Incised Wounds

The usual incised wound in the hand is inflicted by an implement or tool employed in the patient s occupation When the skin alone is involved the problem is simple In uniting the skin, particularly in wounds of the palm of the hand and the tips of the fingers the sutures should be tied as loosely as possible, because if tied needlessly tight intense pain is caused When the wound extends more deeply vessels of importance are apt to be injured making the checking of blood a separate problem. If a tendon is injured this is a distinct problem and the same may be said for a severed nerve Injury to muscle is of less consequence

Injuries to Blood Vessels

The smaller vessels of the fingers are readily controlled by twisting or by ligation The skin should be avoided in making ligation for by including it intense pain is needlessly caused All bleeding points must be carefully secured before the skin sutures are applied The greatest difficulty arises when hemor

rhage occurs in injuries of the palmar arches. Because of their size deep location and the density of the tissues in which they lie injury to either of them may offer a difficult problem A knowledge of their exact location is so important that a review of the topographic anatomy seems advisable The superficial arch lying above the flexor tendon is made up of a branch from the radial anastomosing with the digital branches through the radialis indicis. This arch lies on a level with the web of the thumb a point worth remembering when incising deep abscesses of the palm The deep arch is made up of the continuation of the radial after it winds over the base of the first metacarpal of the thumb and passing across under the flexors of the finger lies on the base of the metacarpal bones. With this knowledge the vessel injured can often be determined from the situation of the wound

In the face of an alarming hemorrhage from the palm a constriction will of course be placed above the elbow as a temporary measure Exploration of the wound in the palm will usually disclose the ends of the severed vessels If this cannot be done particularly in injuries of the deep arch, ligation of the brachial artery just above the elbow is the best procedure This ligation is easily accomplished under local anesthesia by any one while separate ligations about the wrist may be tedious and difficult Injuries to vessels in the forearm and arm are easily diagnosed but when deeply lying the vessels may be difficult to secure This is particularly true of the digital vessel Wounds involving this vessel may be securely packed sufficient to compress the vessel. If the attendant has had some experience he should ligate the vessel at the point of injury

Many wounds can be temporarily secured by tight packing As soon as conditions permit, the packs should be removed and the hemorrhage controlled by ligation.

Injury to Muscles and Fascia

All extensive wounds involve fascia and muscles When incised muscles tend to retract causing the wound to gape. When such wounds are clean cut after cleansing they may be united. If the wound is ragged or uneven, the border should be trimmed free from irregular edges before suturing The muscles are best

united by mattress sutures of fine chromic gut Gentle traction should be made lest the suture tear out. The parts must be so *placed that the muscle is relaxed* as much as possible. The fascia likewise should be sewn with chromic gut This is particularly true of deep fascia surrounding muscle The limb must be kept at rest lest the contracting muscle interfere with union of the fascia, a muscle hernia resulting Cut muscle tends to ooze long after injury and if the injury is a considerable one, *it is best to provide drainage for a few days*

Injury to Tendons

Incised wounds of either the dorsal or palmar surfaces of the hand and forearm are frequently attended by injury of tendons Motion should, therefore always be tested out carefully *in all such injuries in order to ascertain whether tendons have* been severed Loss of motor power alone means severed tendons.

A wound should never be closed in the presence of loss of motor power in the hope that function will return. The complete extent of the injury should be ascertained If the tendon has been cut, it may be necessary to enlarge the wound and split the tendon sheath longitudinally on account of the tendency of the ends of severed tendons to retract. The ends of the severed tendons should be approximated and sutured with very fine silk. The tendon sheath should be carefully approximated and sutured with chromic catgut the fascia closed over it, and the skin closed with silkworm gut or other nonabsorbable suture material. The part should be put at rest in such position as to cause the least traction on the tendon sutures.

Injury to Nerves

Wounds of the upper extremity are frequently attended by division of nerves. This results in motor or sensory paralysis or both if the nerve is a mixed one The median nerve is frequently severed along with the wrist tendons and the ulnar in injuries about the elbow The diagnosis of nerve injury is made from the loss of motor or sensory function or both Before the wound is repaired the ends of the severed nerve trunk should be sought brought together end to end and the sheath sutured with interrupted sutures of very fine silk. The suture material

should not penetrate deeply into the nerve trunk, but only catch the sheath If possible a layer of fascia should be sutured over the repaired nerve to prevent its being caught in a mass of scar tissue The extremity should then be held in such a position as to take all possible strain off the nerve trunk The return of function is variable, often taking from six months to a year or longer depending upon the length of the distally divided segment.

Lacerated Wounds

Lacerated wounds of the hand and arm most frequently result from the gears or other moving parts of machinery These wounds not only injure muscles, tendon and nerves but also frequently grind dirt, clothing, grease or other débris into the wound. The injury frequently results in permanent loss of some part and the problem is to determine what can be saved and what may be sacrificed. The whole problem is one of circulation If there is a likelihood of any part of the limb having an adequate circulation an attempt should be made to save it It can always be removed later on if it is found that the first judgment was too optimistic

Treatment.—The wound should be cleansed thoroughly with green soap and water if it is merely dirty and with benzene if grease has been ground into it. The ragged pieces of tissue are then trimmed off and an attempt is made to approximate the severed parts (Fig 330) If any clean-cut parts are found they may be sutured at once The ragged questionable tissues are best packed loosely with gauze to await the outcome. After a few days it is easier to determine what can be saved In the lacerated wounds it is usually impossible to unite tendons and nerves at the first sitting and because of the almost certainty of infection the attempt is almost sure to fail even if made

In this type of injury the question of amputation of some part often arises. The general rule to save everything possible has certain exceptions Only general rules can be stated. When the thumb index or little finger is concerned only as much as is necessary to sacrifice is removed. A stump of any of these if the metacarpophalanges articulation is normal is often extremely useful. In the case of the middle and ring finger a

disarticulation at the metacarpophalangeal joint is usually advisable A disarticulation leaves a stronger hand and this is always advisable in manual laborers An amputation which includes the head of the metacarpal bone allows the remaining fingers to fall more closely together giving a better cosmetic result. This is desirable in those not engaged in manual labor In finger amputations the ends of the stumps are covered with a flap of skin from the palmar surface in the laboring man, while

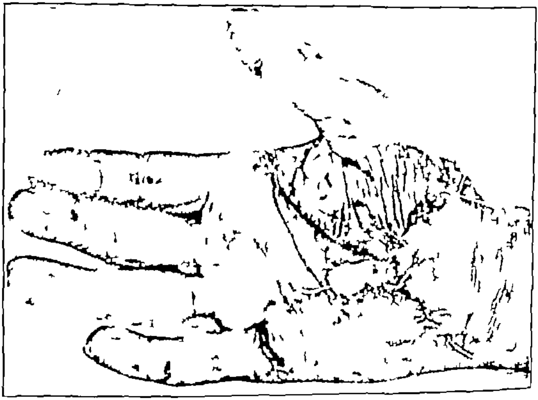


Fig. 330—Lacerated wound of the palm. After cleansing the flaps were approximated with silkworm-gut sutures. The gauze drain was allowed to remain several days.

the dorsal flap is advisable where appearance is the important factor Often it is necessary to secure the flap where the tissue is viable in order to save an additional part of a finger

Puncture and Stab Wounds

Puncture wounds of the upper extremity vary from pin pricks to larger wounds made by knife blades, broken glass nails, etc They frequently do little damage to the tissue but may strike

tendons nerve trunks or large vessels Small puncture wounds are frequently the starting point of the most severe infections of the hand and arm, and the larger and deeper ones are often infected by the tetanus bacillus

Treatment.—It is necessary to carefully inspect the injured member to determine the extent of the injury If there is no loss of function and no hemorrhage it may be treated expectantly after cleansing the surrounding parts or the interior of the wound may be swabbed out with tincture of iodine If there is slight or moderate bleeding packing or compressing the wound may be sufficient If the site of puncture is over one of the palmar arches and there is marked bleeding the severed vessels must be secured If the wound was made by a dirty or rusty instrument or one contaminated with street or stable dirt it should be enlarged and packed for twenty four hours with iodine gauze after which it may be allowed to granulate Extensive cauterization as is sometimes advised is not necessary In wounds of this kind an immunizing dose of tetanus antitoxin should be given

Crushing Injuries

In injuries in which the member has been crushed by a blunt object the skin is little injured and the main parts to suffer are the underlying structures Generally speaking if the blood vessels are uninjured the member can be saved The history of the injury often aids in making the decision When the arm or hand has been run over by a flanged wheel the injury is so great as to make amputation inevitable

Treatment.—Unless it is obvious that the injured parts are damaged beyond repair they should be cleansed and placed at rest in a slightly elevated position If bones are fractured a general apposition should be provided for but no attempt at a perfect alignment need be made until the integrity of the limb is assured Should gangrene develop amputation must be done If not the niceties of adjustment are in order

Gunshot Wounds

The injury from gunshot wounds varies from the clean perforated wound made by a small rifle to a large ragged wound made by a shotgun In the former often only skin fascia and

muscle are injured and it has the aspect of a simple punctured wound. In the latter the destruction includes nerves, large vessels, and bones, especially if the wound is made at close range. Clothing, wads and bullets or shot may be left in the tissues.

Treatment.—In a single perforating wound made by a bullet the entrance and exit of the wound should be treated with tincture of iodine and a dry sterile dressing should be applied. If the bullet has lodged in the tissues, it may be allowed to remain unless its position is such as to invite removal In shotgun wounds a turniquet should always be applied until the wound is carefully inspected because often there is little hemorrhage immediately after the receipt of the injury, but later active hemorrhage may begin without warning When opportunity offers the wound must be inspected all accessible foreign bodies must be removed, and hemorrhage must be controlled. In shotgun wounds time should not be lost in the attempt to remove all the shot. Such wounds must be drained When a bone is fractured it must be managed as any compound fracture Blank cartridge wounds, so common in times gone by were often followed by tetanus Such injuries should be treated by vigorous local sterilization and the patient given an immunizing dose of 1000 units of tetanus antitoxin In shotgun wounds received at long range the shot usually merely penetrates the skin and soft parts and usually in regions where the parts are the softest When the shot are just beneath the skin they should be removed, the wound should be swabbed with tincture of iodine and a dry dressing should be applied. Those lying deeper may be allowed to remain.

Foreign Bodies

The removal of foreign bodies from the hand usually furnishes the first object lesson to the young surgeon that there is a vast difference between theory and practice The x ray shows the object so plainly that it seems a simple matter to cut down on it and remove it It behooves one therefore to carefully consider the problem and to proceed only after a well-calculated plan has been formulated.

Needles and pieces of steel furnish the most common object with small projectiles, pieces of glass, etc closely following The history usually makes the diagnosis when the receipt of the foreign body represents the sole lesion However when the

foreign body gains entrance as a part of a more serious accident, the patient may be unaware of its presence For instance, when the hand is cut with broken glass, as in automobile wrecks etc, fragments are easily overlooked and the wound may be closed without removing them After the wound heals the fragments are surrounded by connective tissue If superficially situated their presence may be first suspected when they are palpated as hard lumps just beneath the skin When more deeply seated pain may be caused by motion of the parts or upon pressure Sometimes the patient has been pricked by a needle but is not certain whether all has been withdrawn or whether a part of it may have remained Fragments are frequently retained in the tissues for years without making disturbance. They may however become infected or otherwise cause disturbance.

Treatment.—Foreign bodies should be located whenever possible by means of the x ray in at least two planes. Making a



Fig. 331.—The dotted line represents a needle extending from the palmar to the dorsal surface medial to the phalanx. The heavy line presents the proper direction for the incision in order to strike the middle of the foreign body with certainty

crosspatching of lines on the surface of the skin with a solution of silver nitrate before the x ray is taken may assist in locating the object more accurately In planning the attack the relation of the foreign body to important structures must be considered first. Nerves must be avoided and tendons should not be exposed unless necessary The region of the foreign body should be adequately blocked off with novocaine solution so that the operator may search unhindered by the agitation of the patient In general the incision should be made at right angles to the longitudinal axis of the foreign body if possible (Fig 331) This gives the operator a larger mark than if the object is approached from one extremity After carrying the incision down to the proximity of the foreign body an attempt should be made to locate it with the point of a knife If this fails, it may be palpated by the finger If reasonable search fails to locate the object, a metal probe may be placed in the depth of the wound

and a new x ray picture made This enables the operator to determine which direction he must proceed from the wound he has made Patience and gentleness combined with perseverance will finally succeed. When the foreign body has been removed the wound is closed without drainage

Wounds of Joints

In any injury at or near a joint the possibility of injury to this structure must be considered. Direct inspection may disclose protrusion of joint surfaces, but in many instances the question cannot be certainly answered If infection does not take place often no evidence of such injury is made manifest in the subsequent management of the case If infection occurs intense pain and swelling soon proclaim the event.

Treatment.—When the wound is merely a puncture the surrounding area should be cleansed and treated with tincture of iodine and a sterile dressing should be applied When there is a definite rent in the capsule or if dirt or débris has entered, the wound should be widely opened and irrigated with normal saline sterilized with tincture of iodine, and the capsule should be closed with fine chromic catgut. Drainage had best be provided The extremity should then be placed in a moulded plaster splint to immobilize the joint If suppuration supervenes the joint must be opened and drained freely Whether the wound heals septically or aseptically passive motion should be instituted in three or four days, and active motion within a week to prevent the formation of adhesions.

Traumatic Tenosynovitis

Traumatic tenosynovitis occurs most frequently in the tendon of the wrist usually on the dorsal side but it may occur in any *tendon sheath. It is the result of a single* injury or may come from doing some unusual form of work or exercise calling for much use of the wrist tendon as tennis playing rowing or working with tools.

This disease is manifested at first by a soreness to pressure in the tendon with pain on motion which call[illegible] tendon into play After a few days there is a grating or cr[illegible] of the tendons as they move in [illegible]

Treatment.—Hot moist packs are the most useful for allaying the acute pain Counterirritants are also useful The extremity should be splinted to put the tendon at rest After the acute pain subsides massage and passive movements are useful The condition usually recovers in from ten days to several weeks.

Sprains (Traumatic Synovitis)

A sprain is an injury to a joint in which its capsule or ligament or the bony point of attachment of a ligament has been ruptured A traumatic synovitis is the result of an injury to the articular surface of the bones which comprise the joint or to some part of the capsule sufficient to cause an inflammatory reaction The two are often associated Such lesions are common in the wrist and shoulder less common in the elbow Usually there is a history of trauma followed by swelling and pain on motion. Sometimes the patient cannot cite any specific injury

Diagnosis.—In the absence of history of injury the diagnosis must be based on pain in the joint made worse on motion and swelling with effusion into the joint Fracture around the joint must be excluded by means of the x ray

Treatment—For the first acute pain cold wet packs may limit the exudation The joint should be immobilized for a few days and then passive motion begun The effusion usually is promptly absorbed If excessive or persistent it may be aspirated, but this should not be done except under favorable surroundings where strict asepsis is possible Usually this can be avoided if massage and elastic bandaging are diligently employed

Traumatic Bursitis

Bursitis is an inflammation of the synovial sacs covering bony prominences of the body The most important ones in the upper extremity are the subdeltoid and the olecranon Bursitis is commonly caused by either single severe blows over the bursa or frequent slight trauma

Subdeltoid Bursitis

Subdeltoid bursitis occurs under the upper and anterior portion of the deltoid muscle The symptoms of trouble in this bursa are pain in the region of the bursa, tenderness on pressure

over it, and sometimes swelling due to the distention of the bursa with fluid There is much pain on outward rotation of the arm and abduction and not so much on internal rotation or adduction. The pain from a subdeltoid bursitis is sometimes very severe and

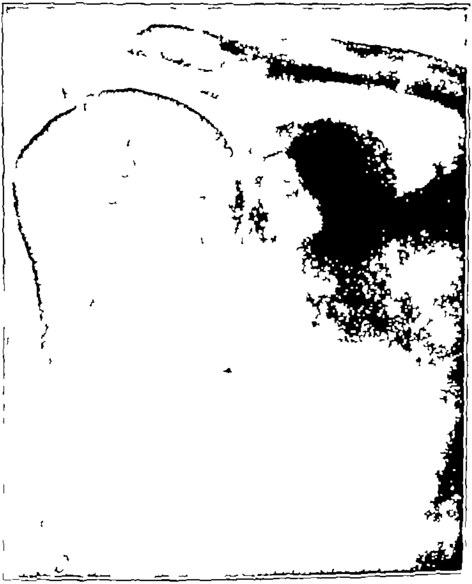


Fig. 332.—Bursitis with calcareous deposit.

radiates down the arm to the hand. The subacute form persists due to adhesion within the bursa. In chronic form the bursa may become calcified (Fig 332) This calcification may be seen as a shadow in the x ray plate

Diagnosis.—Pressure over the site of the bursa and pain on manipulation is sufficient to establish the diagnosis. The chronic form may be determined in many instances with the use of the x ray

Treatment.—Rest in bed is the best treatment for the acute pain The arm should be abducted and held in this position either by pillow or splints. Abduction opens the bursa to its greatest capacity and the patient may be the judge as to the extent of the abduction desirable A few days' rest is usually sufficient for the acute form, avoiding too strenuous use of the arm for a week or ten days

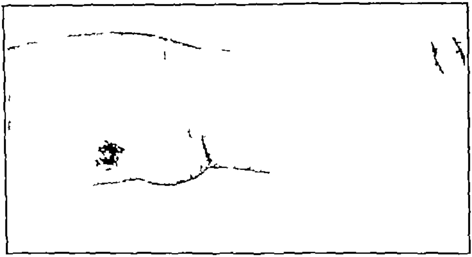


Fig. 333.—Olecranon bursitis due to trauma.

For the subacute form a sudden extreme abduction of the arm should be done to endeavor to break up the adhesions in the bursa. Anesthesia may be required the first time If a calcified bursa gives trouble it should be dissected out

Olecranon Bursitis

Olecranon bursitis is frequently seen as a fluctuating mass just over the end of the olecranon process (Fig 333) It often follows continued irritation hence the term 'miner s elbow sometimes applied to it. Sometimes there is a history of a single trauma but quite as often the patient knows of neither trauma nor injury It is not very painful as a rule and is usually just a little tender to pressure when it first develops.

Diagnosis—The soft bulging mass just on the summit of the olecranon process establishes the diagnosis

Treatment—Tight strapping with adhesive plaster over a distended olecranon bursa will usually cause it to become absorbed in a week or ten days If the swelling persists, the fluid may be aseptically aspirated and the bursa restrapped. If it continually fills the bursa may be dissected out If the bursa becomes infected the sac must be opened, drained and allowed to heal by granulation

Burns and Scalds

Inasmuch as injuries of this sort are most common in the hands this subject will be considered in detail here. Burns may result from contact with heated solids liquids gases or direct exposure to flame For a convenience of description and treatment they are generally divided into three classes corresponding to the extent of the injury In burns of the first degree there is merely an intense erythema In the second degree the epidermis is destroyed while in the third degree the entire skin with or without deep-lying tissue is destroyed.

First Degree Burns

In burns of the first degree there results only an intense erythema with some swelling to be followed by late desquamation of the skin. A severe sunburn is a good example of this type of burn The symptoms are a feeling of heat and pain in the affected part.

Diagnosis—The intense reddening of the surface is at once obvious

Treatment—Very little treatment is required Boric acid ointment or calamine lotion form a protective covering and usually allay the pain If the pain is very severe lead acetate solution and opium compresses may be used. If the surface involved is large lead solution must be used with a degree of caution

Second Degree Burns

In a burn of the second degree in addition to the erythema and swelling there is destruction of the epidermis with usually the formation of blisters The fluid forms under the epidermis and there is no destruction of tissue. The epidermis may be de-

stroyed and there results an exposed derma (Fig 334) The pain is more intense with this degree of burn and there is danger of infection entering the blistered area resulting in suppuration with destruction of the skin

Diagnosis.—The presence of blisters makes it unlikely that deeper tissues are destroyed When the entire epidermis is destroyed it is not always possible to tell whether or not deeper tissues have been destroyed It may be necessary in such cases to await the exfoliation of the destroyed layers before it is possible to tell whether or not the deeper tissues have been destroyed

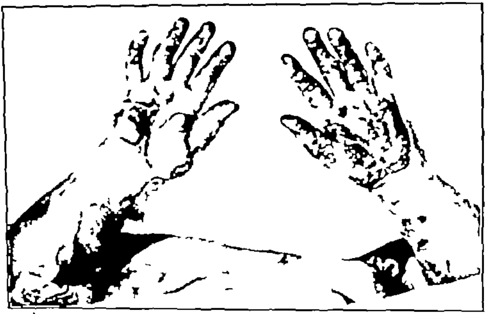


Fig 334.—Second degree burn.

Treatment.—Where the burned area is small, a sterile gauze dressing soaked in a cold saturated solution of sodium bicarbonate is very efficacious in relieving the pain. This dressing should be kept moist with the solution until the pain subsides. After about forty-eight hours the blisters should be pricked open at one point along the edge and allowed to drain The epidermal covering should be left as a protective covering unless the blister is infected in which case it should be entirely removed. After the bicarbonate solution is removed the lesions should be allowed to dry Healing is then rapid.

In more extensive burns the lesions should be covered with sterile gauze dressings saturated with a 5 per cent aqueous solution of tannic acid The dressings should be kept almost dripping wet with this solution. They should be loosely applied and not bound down by bandages unless absolutely necessary to hold them in contact with the skin and in that case, the bandage should be very loosely applied If blisters have formed prior to treatment, the covering of the blisters should be removed before the tannic acid dressings are applied. For burns of the eyelids an ointment of 5 per cent tannic acid in petrolatum should be used instead of the aqueous solution

After the tannic acid has been applied from twenty four to forty-eight hours, the exudate will be coagulated and the skin tanned a deep brown All dressings or ointment should then be removed and the burned parts exposed to the air As healing proceeds the tanned surface gradually scales off

Third Degree Burns

In the third degree burn there is a destruction of tissue which may involve the skin only or the entire thickness of the extremity The wound often presents a blackened charred appearance or parts of the tissue may adhere to the heated object and be torn from the extremity when it is removed The pain is often excruciating and the injury if extensive, is sometimes followed by profound shock. Later the symptoms of sepsis may supervene These may really be the result of infection or they may indicate a toxemia due to the absorption of broken-down protein

Diagnosis.—When the injured area is charred the diagnosis is easy In lesser degrees it is not always possible to say whether or not the skin is destroyed. The differentiation is important because if the skin is destroyed skin grafting will be required, thus lengthening enormously the period of convalescence In many instances in which the skin seems to have been destroyed after a week or two islands of newly formed epidermis are seen to spring up everywhere on the injured surface thus proving that the dermis was not entirely destroyed

Treatment.—Treatment of the shock is the first indication in severe burns This is done by the giving of full doses of morphine hypodermically and the administration of large amounts of fluid

by mouth, rectum, by hypodermoclysis, or intravenously, or by all of these methods if necessary

The local treatment consists first in the application of 5 per cent aqueous solution of tannic acid by the method given under second degree burns. After twenty four to forty eight hours the dressings should be removed and the burned area placed under a tent in which the air is warmed by electric light bulbs.

Infection is one of the serious complications. Sterile sheets or towels should separate the burned areas from the bed clothing If much infection is present wet dressings of 1 5000 acriflavine should be applied for several days at a time If much pus forms beneath the tanned surface, this must be removed and wet acri flavine dressings applied

After the burned tissue has been extruded a dressing of paraffin and beeswax forms an excellent protection This is wetted and painted on with a camel s-hair brush or sprayed on with a nebu lizer An ordinary spray gun such as is used to spray insecticides on vegetation is always obtainable and works better than the nebulizers made for the purpose The dressing should cover one-half to one inch of healthy skin all around the wound. It should be changed every day and the retained secretions mopped away If there is much infection, the paraffin dressing may be omitted occasionally for a few days and wet 1.5000 acriflavine dressings applied.

If the burned area is very large skin grafting should be done early in order to expedite recovery and lessen scar formation.

When burns involve the flexor surface of articulations, care must be taken to prevent the scar from drawing the parts into a permanently flexed position This may be done by keeping the part on a splint in extension. It is in such situations that skin grafting is imperative If skin only has been destroyed Thiersch grafts may suffice but if tendons or joint surfaces are exposed, whole skin flaps obtained from the abdomen or thigh must be employed. When burns destroy the blood supply or tendons of an extremity amputation is the only recourse

Injuries Due to Cold

Injuries inflicted by low temperature are analogous to those caused by heat and may be similarly divided into three degrees, according to the extent of injury to the tissues.

In the first stage of exposure to cold the part becomes bluish red and then white When the cold ceases to act the part again becomes a distinct red color with a little swelling of the tissues This is followed by exfoliation of the epidermis

In the second degree, bullae form over the exposed parts which contain a rusty colored serum. Later ulceration of the skin may follow

In the third degree the derma is destroyed and there is involvement of the deeper tissues even to thrombosis. When this occurs gangrene of the part is the inevitable result

It is by no means easy to determine at once the degree of the injury It is much more difficult than in the case of burns. What may appear to be merely a frostbite may result in gangrene of the extremity Prolonged exposure to wet as well as cold is more apt to end in grave changes than a short exposure to extreme dry cold. A positive diagnosis should always be held in reserve until the outcome is definitely assured

Treatment.—In the first degree the part should be rubbed with snow or rubbed while being held in cold water until the circulation returns The part should then be bathed in alcohol to prevent chilblain

The second degree should be treated the same as the first and in addition the bullae should be punctured and drained as they form. The parts should be covered with alcohol-soaked gauze dressings If the skin becomes ulcerated the ulcerated area should be covered with 10 to 20 per cent ichthyol or balsam or Peru ointment and a sterile gauze dressing applied.

The third degree should be treated by washing the exposed part with alcohol and then covering it with dry sterile gauze dressings A sterile dusting powder of boric acid or oxide of zinc should be used to keep the part dry

When a line of demarcation forms and one is convinced that the part is dead throughout the part should be amputated Amputation should never be hastily resorted to for frequently only the skin sloughs and the part may be saved by skin grafting

Chilblain

Chilblain is much more common on the feet but may occur on the hands It follows frequent exposure to the first degree of

cold or the too sudden warming of a part that has been blanched by cold. The symptoms are a continual and intense itching and burning of the skin with swelling and congestion of the part whenever it has been exposed to cold and then quickly warmed. Fissures and ulceration may follow severe cases which may heal slowly. Ten to 20 per cent ichthyol or balsam of Peru ointment *should be used and the parts protected from further chilling.*

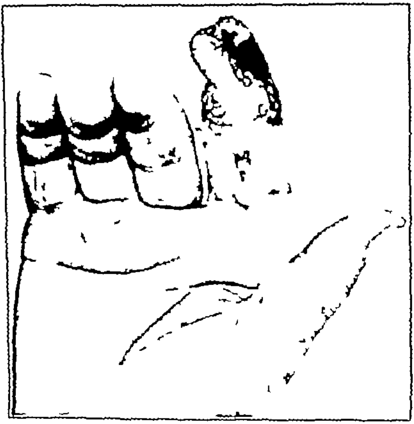


Fig. 33.—Gangrene of the index finger due to prolonged application of saturated solution of aluminum acetate.

Gangrene Due to the Use of Drugs

The injudicious use of solutions of phenol in dressings has been responsible for by far the majority of cases of gangrene of the fingers. The much less frequent use of phenol in dressings has materially reduced the number of cases of gangrene. The use of watery solution of phenol in dressings cannot be too strongly condemned. Even 1 to 5 per cent solutions have produced gan

grene. The tissues exposed to phenol first turn white then brown as gangrene starts, and finally they turn black. It is a dry gangrene It may involve only the skin or all of the tissues. The gangrene is accompanied by little or no pain. After a few days demarcation takes place and the gangrenous portion starts to separate Suppuration and abscess formation may occur When a phenol burn is discovered, it should be neutralized at once with alcohol If the action has been completed nothing can be done but await results. If the epidermis alone is destroyed, healing takes place though slowly If the dermis is destroyed, skin grafting should be done unless the area involved is small If the deeper tissue is destroyed amputation must be done.

Much less frequently gangrene follows the prolonged use of aluminum acetate (Fig 335) The process is much slower than with carbolic acid a number of days being required before death of tissue begins

Any wet dressing if used too long may produce gangrene I have seen it follow the use of boric acid solution No wet dressing should be used for longer than twenty four or forty-eight hours without a prolonged intermission.

CHAPTER XVII

TUMORS AND DEFORMITIES OF THE UPPER EXTREMITY

Generally speaking the tumors of the hand and arm are relatively few and unimportant Since most of these occur on the hand however they require attention for cosmetic reasons, if for no other A few are important in their own right and others become important if injudiciously managed

Ganglion

These tumors occur most commonly on the dorsum of the hand, but they may occur wherever there is a tendon They are mucinous or gelatinous, containing cysts situated on tendon sheaths but generally do not communicate with them They follow unusual use of muscles, either in kind or degree and are most often seen in the adolescent or earlier years of adult life They may cause some pain early in their existence but later occasion distress only because of the deformity they produce They appear as hemispherical tumors projecting above the level of the surrounding region (Fig 336) They are tense elastic, do not move with the tendon, and are but slightly movable on manipulation.

Diagnosis.—The above description sufficiently characterizes them Small fibromas and lipomas bear a superficial resemblance on inspection but they have a mobility more extensive and they lack the tense elastic feel Exostoses about the carpal bones are harder and not at all movable Xanthomatous tumors of the tendon sheaths are more nearly globular seldom perfectly smooth, and seldom are situated just over a tendon.

Treatment.—A sharp blow on these tumors causing them to discharge their contents into the tendon sheath or into the surrounding tissues produces a temporary and occasionally a permanent cure Usually however they recur when so treated, therefore they should be excised After surrounding them with novocaine solution the operator may expose them by an incision directly over their summit They are then loosened from their

surrounding tissue with the handle of the scalpel down to the tendon sheath The base is then cut off Usually in doing this the sheath is cut through and the tendon is exposed After removal, the tendon is covered with what remains of the sheath and then the subcutaneous tissue and fascia are covered over this. Care must be taken to control all hemorrhage lest bleeding being temporarily checked by the adrenalin, start again and produce a hematoma Since the tendon sheath is likely to be open, perfect asepsis must be maintained throughout. The hand must be kept at rest for a few days, preferably by a short anterior splint



Fig. 336 —Ganglion of the extensor tendons of the wrist.

Xanthomas

Xanthomas because they contain cells with many nuclei, are sometimes called giant celled sarcomas They usually spring from the tendon sheaths most often on the palmar surfaces of the fingers but may occur anywhere (Fig 337) They stand out as globular tumors (Fig 338) usually with slight bosselations. *They do not move upon their base but are free from the skin.* They grow slowly and cause no inconvenience except from their presence

Diagnosis —Their generally globular outline with small irregularities of the surface is characteristic Their situation about the tendon sheaths is a point of additional evidence When cut into



Fig. 33 —Xanthoma of the elbow

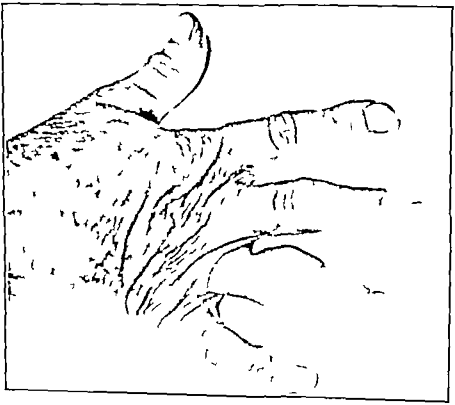


Fig. 318.—Xanthoma of the ring finger

their yellow appearance may suggest a lipoma, but the cut surface lacks the glossy appearance of lipomas and they are much firmer

Treatment.—Those who call these tumors giant-celled sarcomas are likely to amputate the digit harboring them. This is unnecessary If the tumors are completely removed, including their capsule and the portion of the sheath of the tendon over which they lie recurrence will not take place If improperly removed and recurrence takes place the recurrent tumor should be excised Once the whole tumor and its sheath are removed they do not again recur Occasionally these tumors are so numerous and extensive that amputation is advisable

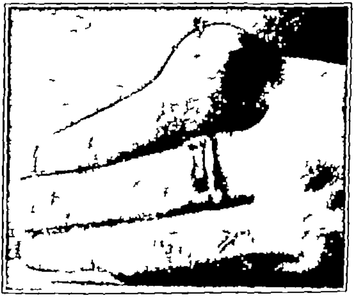


Fig. 338 —Enchondroma of the index finger

Osteomas and Chondromas

Bony or cartilaginous outgrowths may occur anywhere about the bones but are most common about the joints They may cause bending of the bones, especially when they occur on the phlanges in children (Figs 339 and 340) The osteomas are dense and slow growing and usually cause no inconvenience (Figs. 341 and 342) Sometimes bursae form over them. They are then very painful. About the wrist joint, and particularly about the shoulder exostoses and ecchondroses must be regarded with grave suspicion *The former is sometimes and the latter is* usually malignant.

Diagnosis—Their fixity and hardness are very suggestive of their nature, a fact which is readily verified by means of the x ray Cartilaginous tumors, particularly about the wrist should always be regarded with suspicion for these sometimes despite their innocent histologic structure may recur and take on malignancy

Treatment.—Excision with bone cutting forceps is easy and usually effective Their structure and subsequent course should be studied lest a malignancy be overlooked



Fig. 340—Enchondromas of the metacarpal and phalangeal bones.

Varices

Massive dilatation of the veins or lymphatics are uncommon tumors sometimes seen on the hand. When the veins are involved they disappear on pressure, likewise the overlying skin may appear unduly blue (Fig 343) Lymphatic varices do not disappear on pressure and the overlying skin is mottled. They are usually lobulated (Fig 344) They are usually congenital but may not be observed in the earlier months or years of life

They cause an irregular enlargement of the region affected but do not cause any discomfort or disability

Diagnosis—The irregular appearance together with the compressibility characterize the venous type The lymphatic type

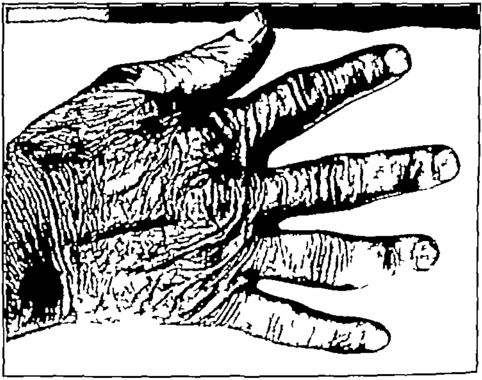


Fig 341—Exostosis of the middle finger

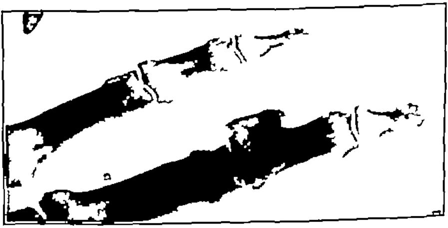


Fig. 342—Exostosis of the middle finger

is recognized by the broad irregular surface situated without relation to any deep-lying structure

Treatment—The venous type is usually cured by ligating the chief veins going into and from the tumor If this fails, the venous mass must be excised Excision alone is of avail in the



Fig. 343—Cavernous venous angioma of the hand.



Fig 344.—Lymphangioma of the forearm.

lymphatic type In excising either type the operator must be prepared for a complicated and tedious operation This is particularly true of the lymphatic type The various processes may

extend between the tendons of the neighborhood, requiring careful and extensive dissection. For this same reason asepsis must be most rigid.

Inclusion Cysts

Inclusion cysts are small epidermal cysts usually occurring on the palm of the hand They are supposed to be the result of displacement of epithelium by some previous injury In most cases, however, no history of such injury is obtainable. They appear as hemispherical or oblong elevations attached to the skin (Fig 345) They cause no pain unless irritated from use of the hand



Fig. 345—Inclusion cyst of the palm of the hand.

Diagnosis—Sluggish superficial abscesses may simulate the inclusion cysts but usually these have a definite history of shorter duration and are usually painful Solid tumors may resemble the cysts (Fig 346)

Treatment—The cysts must be excised bodily

Synovial Cysts

Somewhat rare but clinically important cysts occur about the joints of the fingers (Fig 347) They form small dense circumscribed tumors on the dorsal surface of joints. They may be painful but usually the disturbance is only cosmetic

Diagnosis—Their situation over joints, particularly when there is no tendon, is quite characteristic

Treatment.—They must be completely removed If any portion of the sac is left, they quickly reform Since the joint capsule is opened in the operation the technic must be carefully aseptic.

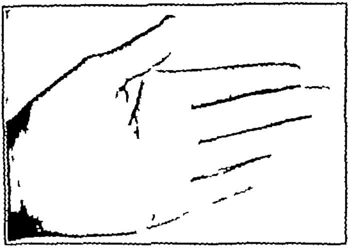


Fig 346.—Fibroma of the palm of the hand.

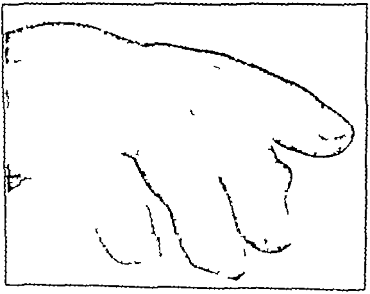


Fig. 347 —Synovial cyst of the terminal joint of the middle finger

Lipomas

Lipomas may occur anywhere on the upper extremity, but they occur most frequently about the shoulder less often on the upper arm and forearm (Fig 348) On the hand they appear



Fig 348 —Lipoma of the arm.

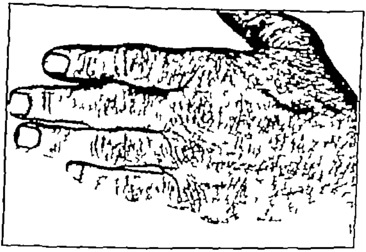


Fig 349 —Lipoma of the dorsum of the hand.

about the digits and occasionally in the palm occasionally they are deep-seated producing a general bulging of the palm They are less common on the dorsum (Fig 349) They appear as flat, ovoid tumors unattached to the skin or underlying tissue soft



Fig. 3 6.—Multiple fibrolipomas of the forearm.

semielastic and not painful Fibrolipomas occur as multiple bilaterally symmetrical tumors (Fig 350)

Diagnosis—The tumors being typically situated a glance and a touch secures the diagnosis Wens must be thought of. They are attached to the skin Deep tuberculosis of the palm may simulate a lipoma but often gives a crunching sense on manipulation and often there is an extension above the annular ligament which does not occur in lipomas of the palm

Treatment—Simple excision is easily accomplished. When situated on the hand the relation to nerves and tendons must be kept in mind lest these structures be injured. The multiple fibrolipomas require no treatment

Neurofibromas

Neurofibromas are small hard tumors occurring about the shafts or end organs of nerves The deep ones are sometimes sarcomatous in nature and all of them must be regarded with suspicion. On the forearm they are often multiple and symmetrical Only occasionally they cause pain or tingling when situated on the shafts of important nerves

Diagnosis—The multiple variety are characterized by their multiplicity which is heightened by the symmetrical distribution over both extremities. Those situated deeper are recognized by their density and fixity in a vertical direction and slight mobility in a lateral direction Those situated superficially on the digits are small hard masses just beneath the skin.

Treatment.—The multiple symmetrical type may be ignored the solitary small superficial ones may be excised. Those lying deep on important nerves may be excised when this can be done without breaking the continuity of the nerves.

Granulomas

Granulomas are small wart like tumors which usually occur on the extremities of the fingers (Fig 351), often about the nail beds. They follow some injury which is followed by a low grade of inflammation, hence they are very properly called pyogenic granulomas by the dermatologists. They are not true tumors but

reactions to infection They develop slowly, attain a certain size, and remain stationary

Diagnosis.—Their peculiar red color and tendency to bleed when injured is characteristic Their structure of small vessels and round cells cause the inexperienced to regard them as sarcomatous A thought as to their situation and origin should allay any such fears

Treatment.—Complete removal by excision or cautery effectually disposes of them When not completely removed they tend to recur this may give rise to a suspicion that they are malignant.

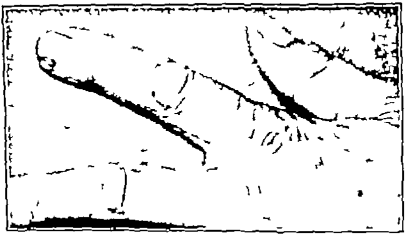


Fig. 331.—Granuloma of the nail bed of the index finger

Warts

Papillomas, fibromatous and epithelial are a very *common affection* of the hand especially in boys The fibromatous warts are sometimes congenital. The epithelial warts of the hand cause inconvenience only by their presence Occasionally they occur under the tips of the finger nails when they may cause pain through the irritation to which they are subjected in this *situation*

Diagnosis—The fibrous warts are softer and may be pedunculated. The epithelial warts are usually of the same diameter throughout In adults solitary warts which are irritated and painful should be regarded with some suspicion, for they are sometimes the beginning of carcinomas.

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Fig. 251—Granuloma of the nail bed of the index finger

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Diagnosis.—The fibrous warts are softer and may be pedunculated. The epithelial warts are usually of the same diameter throughout In adults solitary warts which are irritated and painful should be regarded with some suspicion for they are sometimes the beginning of carcinomas.

Treatment.—The fibrous type must be excised The epithelial type may be treated with a saturated solution of salicylic acid in collodion or the skin may be anesthetized with novocaine and the whole wart lifted out with a sharp curette or destroyed with a cautery The painful type and the irritated type should be excised. The multiple variety occurring on the hands of small boys may be disregarded. They usually disappear before the arrival of the fastidious age

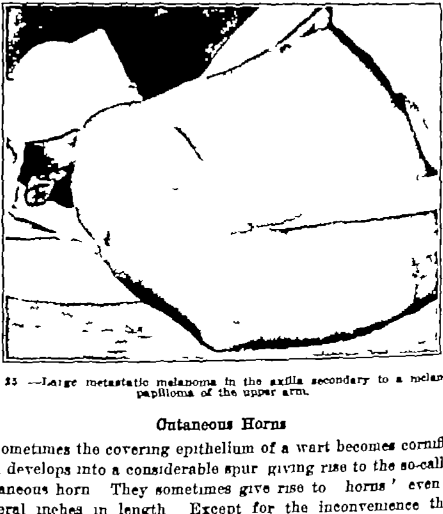


Fig. 25 —Large metastatic melanoma in the axilla secondary to a melanotic papilloma of the upper arm.

Cutaneous Horns

Sometimes the covering epithelium of a wart becomes cornified and develops into a considerable spur giving rise to the so-called cutaneous horn They sometimes give rise to horns ' even to several inches in length Except for the inconvenience they cause they are innocent save in rare instances where carcinomas develop about their base

Diagnosis.—Their density and form make their nature obvious. The skin about their base must be inspected and if it is indurated or ulcerated malignancy must be assumed.

Treatment.—Excision is the only treatment If the skin of the base is indurated suggesting malignancy a margin of half an inch must be allowed otherwise the line of incision may be placed close to the base

Melanomas

Pigmented warts on the back of the hand and forearm are common and when they are multiple they need cause no concern



Fig. 353.—Melanotic papilloma which has produced a large fungating mass without discoverable *metastasis*.

When solitary they should be excised This is particularly true in those situated on the shoulder No matter how small the tumor the axilla should be examined for possible malignancy and conversely when tumors of doubtful origin are found in the axilla, the shoulder and arm should be searched for possible melanomas as a source of metastasis (Fig 352) Sometimes these melanomas form large bleeding tumors without producing metastasis (Fig 353) Some melanotic warts are flat, yellowish

brown and slightly bosselated These too, may give rise to metastasis (Fig 354)

Diagnosis.—The color of these papillomas establishes the diagnosis. Though there is no evidence of metastasis, it should always be suspected, and should the patient subsequently show other affections, particularly of the spine or parenchymatous organs, the melanoma should be suspected until the lesion is proved of other nature



Fig 354 —Melanoma with little yellowish pigment.

Treatment—Wide excision only is permissible Cautery radium or x ray but invite metastasis Once metastasis has occurred, the outlook is hopeless

Epitheliomas

Epitheliomas appear innocently enough on the back of the hand as a keratotic lesion or a flat elevation with indurated base

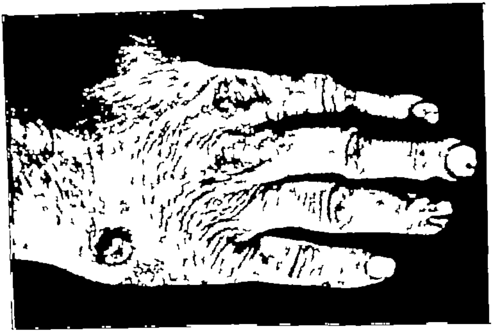


Fig. 355.—Carcinoma of the dorsum of the hand. It is confined to the skin with no induration about the base

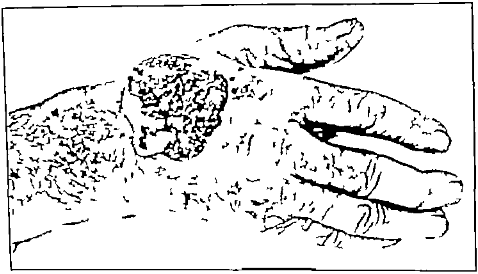


Fig. 356.—Advanced carcinoma of the hand.

(Fig 355) As they develop the base spreads and the surface ulcerates (Fig 356) the borders are firm, and may show the tell tale epithelial nests. As they grow they involve the deeper tissues. They are prone to relatively early involvement of the axillary lymph nodes. Epithelial malignancies elsewhere than on the

back of the hand are rare in the upper extremity but are occasionally observed

Diagnosis—In the beginning they may be mistaken for ring worms or tuberculous lesions of the skin. Their dense borders should suggest the differentiation

Treatment.—Early local excision will cure them if performed before the base becomes indurated. X ray should be avoided because these tumors are peculiarly resistant to this form of treatment. Once the deeper tissues are involved, amputation must be done, and once the axillary lymph nodes are affected, the condition is hopeless.

Sarcomas

Sarcomas may occur in the skin or fascia, producing globular tumors free from the skin but loosely attached to the underlying tissues. They rarely involve the tendon sheaths. They are most common about the elbow and shoulder Periosteal sarcomas likewise are common in both the forearm and arm Giant-celled sarcomas above the wrist and near the head of the humerus are not uncommon.

Diagnosis—The relatively rapid growth characterizes these tumors when the fascia is involved. They must be differentiated from lipomas and neurofibromas The bone tumors must be distinguished from bone cysts and inflammatory conditions. The x ray aids materially in this, but often the experienced oncologist is in doubt.

Treatment.—*Many giant-celled sarcomas are curable by local extirpation.* Fascial and periosteal sarcomas are rarely cured by any operation.

CONGENITAL DEFORMITIES

The minor congenital deformities are few and unimportant. Polydigitism in which usually the thumb or little finger is duplicated and webbed fingers comprise the list Acquired deformities comprise a large number of conditions the result of a variety of injuries.

Syndactylism

Syndactylism or webbed fingers is an abnormal development of the web between two fingers. The web may extend only part

way or completely to the end of the fingers It may involve only two or all of the fingers It is often bilateral A similar condition may occur after burns or scalds or any injury causing a loss of skin on the sides of two adjacent fingers if these fingers are allowed to remain in contact until healing is completed An x ray will show whether there is any connection between the bones

Diagnosis—It is usually a simple matter to distinguish between acquired and congenital deformities Occasionally an x ray picture gives valuable information relative to the state of the joint or bone Frequently the congenital variety has been operated upon and then the condition may be in part traumatic and in part congenital.



Fig 157—Web fingers corrected by operation.

Treatment.—Although the deformity may be corrected at any age, it is best done about four years of age If the bones are united nothing can be done The worst obstruction in the way of success is the tendency for the web to reform after operation. The thinner and wider the web the easier to cover all raw places with skin.

The technic of operation is as follows a V-shaped flap of skin is made between two connected fingers the base of the flap being about on a level with the metacarpophalangeal articulation and the flap long enough to reach through to the palmar skin An incision is then made in the midline of one finger the full length of the finger on the dorsal surface and this flap is dissected loose to the adjacent finger The same incision is then made in the midline on the palmar surface of the finger and the flap is dis-

sected back to the first finger The remaining web is then cut. The V shaped flap is pulled down between the fingers and sutured to the palmar skin and the other skin flaps are wrapped around the raw surface of the finger to which they are attached and sutured there (Fig 357) The wound is dressed with the fingers separated until healing is complete

Polydactylism

Usually the supernumerary member is small with imperfect joint attachment This is particularly true of the little finger The thumb more often shares the joint articulation with its fellow

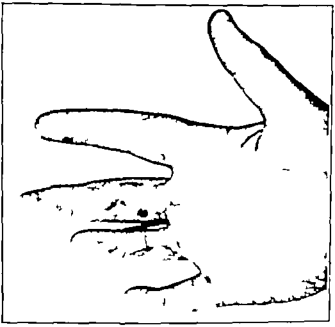


Fig 358 —Scar contraction following a burn of the finger Flexion is good as is extension, to the limits allowed by the scar Cured by operation.

Diagnosis —Occasionally the member is so rudimentary that it appears as a soft polyp the true nature not being discovered until a cartilaginous cave is found after a section is made When the accessory member is well formed an x ray will give definite information as to the relation of the joint to each digit.

Treatment.—The extra digit should always be removed early in life to prevent the occurrence of a misshaped hand. If there is a true articulation with metacarpal care should be taken not to injure the articulation or bone of the neighboring finger If

a normal joint is opened it should be sutured and the joint im mobilized for a week

Acquired Deformities

Following severe burns or scalds, cellulitis of the hand or arm or suppurative tenosynovitis or fractures many types of permanent deformities may remain They may involve the phal anges or wrist or both If the bursa or joints are involved in the process that caused the deformity the case becomes still more serious

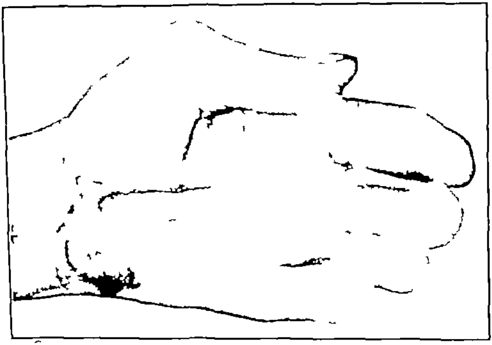


Fig. 358 —Scarring of the finger following suppuration. The tendon was destroyed and a plastic operation was not advised.

Contractures Due to Scar

In extensive burns of the flexor surfaces of joints the scar which forms will frequently draw the articulation in partial flexion and prevent its complete extension thus leaving a per manent deformity (Fig 358) Where this scar involves the palmar surface of the hand the injury is extremely disfiguring and disabling Following a suppurative tenosynovitis the for mation of scar in the tendon sheaths or allowing the fingers to

remain constantly flexed during healing often results in an inability to extend the finger (Fig 359)

Diagnosis—Obvious as the condition is before treatment is undertaken, the exact relation of the scar to underlying tissue must be determined. If the motive powers are destroyed, correction of position avails little The availability of suitable tissue for repair also must be taken into account. Finally the cooperation likely to be extended by the patient or parent must

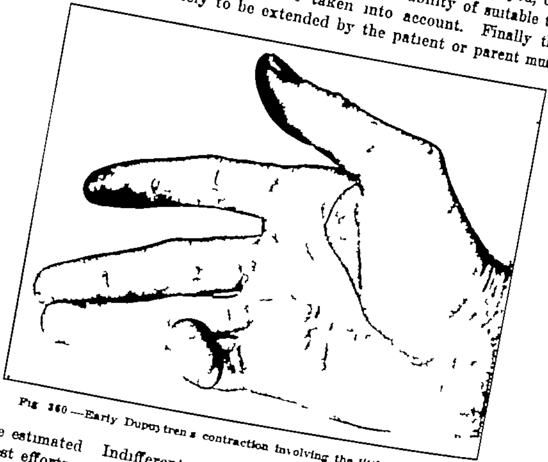


Fig 360 —Early Dupuytren's contraction involving the little finger only

be estimated Indifferent cooperation may defeat the surgeon's best efforts

Treatment.—As a prophylactic measure where the skin over the flexor surface of articulation has been burned or scalded deeply the part should be immobilized with the articulation in complete extension. While this is not always sufficient to prevent scar contracture it should always be done If contracture occurs in spite of this precaution the scar must be dissected out as completely as possible and a pedicled flap of skin sutured into the denuded area This flap is usually taken from the

abdominal wall When healed in place the pedicle is cut and the flap shaped Thiersch grafts placed over a burned area during the course of healing will not prevent scar contracture After scar has been cut away, the articulation should be placed in complete extension and held there until the flap graft heals into place

When the burns have involved the tendon but little can be done in the way of restoration of the function of the hand

In cases of suppurative tenosynovitis which have been allowed to heal with the finger in partial flexion extension of the finger under general anesthesia followed by daily active and passive extension and flexion is indicated. They should be given exercise daily in the form of work or play which calls for an extension and flexion of the fingers Hot packs and massage also help When these fail the transplantation of flaps of fat and tendon followed by manipulation is often successful in partially restoring function. If the tendons are destroyed early amputation should be done

Dupuytren's Contracture

Dupuytren's contracture is a contracture of the palmar fascia resulting in gradual and permanent flexion of the fingers. The little (Fig 360) and ring fingers are usually involved first, but all may be affected (Fig 361) The contracted fascia may be seen and palpated in the palm of the hand It has the appearance and feel of a tendon. The condition has been thought to be caused by repeated trauma to the palm of the hand or the subjecting of it to constant friction by certain forms of manual labor This would seem reasonable but as it sometimes occurs in those who do no manual labor this explanation is not altogether satisfactory

Diagnosis.—Usually the diagnosis is self-evident but occasionally particularly in persons protected by industrial insurance, the patient will claim injury when none preceded the development of the deformity

Treatment.—Stretching the fascia by forcible extension and holding the finger in extension by splints will not remedy the condition. The condition recurs soon after the splint is removed

While the surgical treatment has not yielded brilliant results, it has done enough to justify a trial. An incision should be made in the palm and the skin dissected from the palmar fascia. The fascia should then be completely dissected out, loosening its connection with the tendon and muscles. The skin should then be approximated and the finger held in extension by splints until healing is complete. The patient should understand that recurrence will likely take place.



Fig. 361 —Dupuytren's contraction involving three fingers.

Volkmann Contracture

Volkmann contracture is the result of a fibrosis of the flexor muscles of the forearm resulting in permanent flexion of the fingers and hand. It may be caused by the application of a tight splint, cast or bandage to the forearm shutting off the blood supply to the muscles. It is important to remember that this condition may result from the injury without the influence of tight bandages. If this fact is overlooked a fellow practitioner may be unjustly censured. The result is muscle degeneration

with fibrosis and contracture Complete disability follows and one that is very difficult if not impossible to remedy

Diagnosis—Confusion in the literature has been caused by a failure to distinguish between a section of the muscle and a true Volkmann contracture In the former the larger part of the muscle may be intact while in the latter the entire belly of the muscle has undergone fibrosis.

Treatment.—Prophylactic treatment consists in exercising extreme care in splinting or bandaging the forearm Any splint that causes pain is too tightly applied Bandages should never be placed around the elbow with the forearm almost in extension and the elbow flexed later to carry it in a sling This tightens the bandage and produces an anemia of the forearm

If seen when the contracture is just starting the splint or bandages should be removed and the wrist should be put up in hyperextension with the fingers in extension and slightly flexed at the metacarpophalangeal joints Daily active and passive motions with massage of the muscle will usually result in recovery

When the contracture has formed, the corrective method of Robert Jones should be tried With this method the wrist is placed in extreme flexion and the fingers are extended and splinted until they are straight. Keeping the fingers straight the wrist is gradually extended, being kept on a splint continually until it is in the position of hyperextension Exercise and massage are also used with this

CHAPTER XVIII

INFLAMMATORY INFECTIONS OF THE UPPER EXTREMITY

There is no department of surgery more fraught with responsibility than the management of infections of the upper extremity A simple infection from a slight injury may be of little consequence but it may extend to the tendon sheaths and may threaten limb and life of the patient. There is no operation so generally botched as that for the relief of the deep infections of the hand. There are ten surgeons who can do a hysterectomy to one who knows how to open these deep infections Any one who has seen the monotonous procession of individuals carrying deep infections of the hand who have received, in lieu of proper treatment, a series of small pricks with a lancet will understand the meaning of these lines.

In the accompanying paragraphs an attempt will be made to describe the different types of infection. The point that will be emphasized is the need of differentiating between the superficial and the deep infections and the need of early and adequate incision in the latter

Superficial Infections

Most wounds of the hand are attended by slight infection. A slight reddening a few drops of pus and a scab and the wound is healed. There is but little pain and that in proportion to the reaction about the wound. Small spontaneous infections may arise A small red papule a little tenderness and a little pus and the wound is healed. When such healing is delayed other possibilities must be considered If recovery is prolonged or there is pain out of proportion to the size of the lesion or swelling beyond the area of redness or unusual constitutional disturbance, a specific type of infection demanding a special line of attack may be present

These slight infections instead of localizing may spread beneath the skin (Fig 362) If long neglected they may perforate

spontaneously at one or more places leaving an undermined cavity but imperfectly drained (Fig 363) When these infections are endermic ulcerations may be produced lifting the epidermis off blister like for wide areas (Fig 364) These often run a very chronic course when neglected Chronic subcutaneous abscesses may form in the palm (Fig 365)

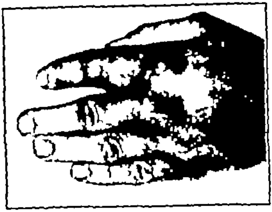


Fig. 362.—Superficial infection of the dorsum of the index finger resulting in a subcutaneous abscess.



Fig. 363.—Superficial infection of the dorsum of the little finger which resulted in a spontaneous opening after the entire dorsum had been undermined.

Diagnosis.—The question to be decided is whether the infection will remain localized and superficial or whether deep infection will result. Generally speaking those on the dorsal surface will remain localized while those on the palmar surface will likely result in deep infection. Deep-seated diffuse pain, swell-

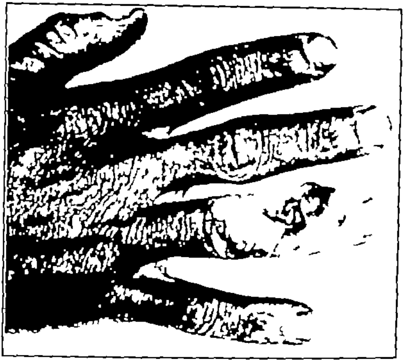


Fig. 364.—Superficial infection of the dorsal surface of the fourth finger resulting in the separation of the epidermis and an ulceration of the skin.

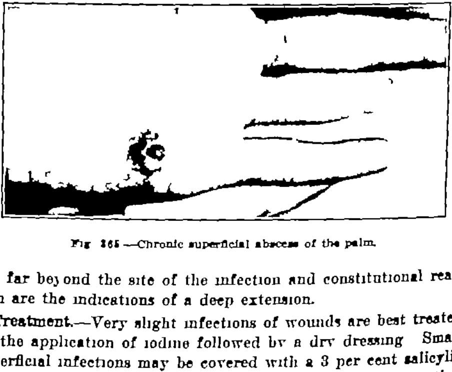


Fig. 365.—Chronic superficial abscess of the palm.

ing far beyond the site of the infection and constitutional reaction are the indications of a deep extension.

Treatment.—Very slight infections of wounds are best treated by the application of iodine followed by a dry dressing. Small superficial infections may be covered with a 3 per cent salicylic ointment. Those lying below the skin but showing a disposition

to point may be treated at first with hot antiseptic packs and when softening occurs they should be freely opened (Figs 366 and 367)

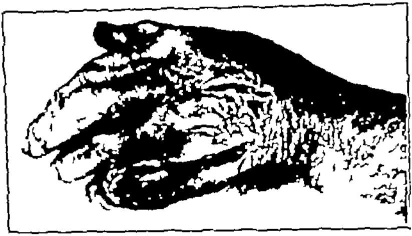


Fig. 366.—Dorsal infection of the little finger properly opened.

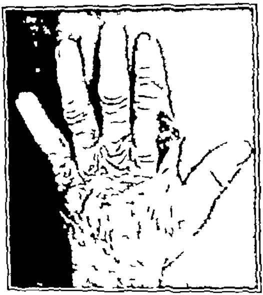


Fig. 367.—A superficial abscess which has been properly opened. A loose pack was placed for two days. The photograph was taken at the time of removal of the pack.

Furuncles

Boils are frequently found on the dorsum of the hand and forearms. What appears as a small pimple with an undue amount of pain and area of swelling continues until the typical volcano of woe is fully formed which in unnamed multitudes

was judged by Jehovah as best calculated to try the soul of man. There is just one man in history whom a crop of these did not incite to profanity Let the practitioner when confronted by this disease, therefore, be duly impressed by its dignity The little pimple develops day by day until at the end of three or four days it has objectively attained a diameter of 2 or 3 centimeters and an elevation of half as much (Fig 368) but subjectively it is as though Vesuvius gone mad had been attached to the sufferer's extremity The summit becomes a reddish blue softens finally ruptures and discharges pus and as a last act extrudes a mass of necrotic pus infiltrated tissue popularly designated as the ' core ' Then the lesion heals, perchance to be followed by others of the same species due to infection of hair follicles by the discharge from the first Constitutional disturbances are not great,—moderate leucocytosis, some fever and loss of appetite are common, but in rare instances these are severe and may even be the precursors of a general septicemia



Fig 368.—Furuncle of the arm, four days duration.

Diagnosis.—The form mode of onset, and rate of progress are distinctive Specific infections are slower of development and are less typically pyriform What is apparently a boil in its beginning which is delayed in its development must be suspected of being a sporatrichosis, a streptococcus or other slowly developing infection.

Treatment.—Early in its development a boil may be aborted by boring into its summit with a triangle pointed needle which has been dipped into carbolic acid. An anesthetic is not needed because the carbolic acid itself acts as such The entire papule may be destroyed by cautery or excision after the affected area

has been anesthetized by novocaine Once it has developed beyond the point where abortive treatment is futile measures should be used to hasten its development A plaster of 2 to 5 per cent salicylic acid or mercurial ointment hastens its perforation The former acts as an antiseptic as well as tends to prevent infection of the surrounding hair follicles When the center has become softened the opening of it may be expedited by incision The area occupied by the boil should be blocked off by a ring of novocaine solution and the incision made well across its summit. The center may be curetted and cauterized with carbolic acid or other liquid antiseptic and the wound lightly packed Usually neither the aggregate of pain nor the time of recovery is lessened by incision The salicylic acid plaster is attended with less fuss and expense to the patient and does not cause more pain than incision.

Furuncles which occur in the axilla are particularly likely to be followed by successive crops. Here early incision followed by hot aseptic packs is recommended if the disease is sufficient to keep the patient to his bed Otherwise the salicylic plaster may be used with satisfaction

Carbuncles

As a corollary to the boils carbuncles must be considered They are much less common on the hand and arm than on the nape of the neck. Instead of one point of infection as in boils, carbuncles have many foci so closely situated that their infiltrated areas coalesce forming an indurated area 5 to 15 cm in diameter The surface is a lurid blue and the area of skin immediately about an intense red. They are more apt than boils to be attended by constitutional disturbances As the lesion develops pus escapes from a multitude of small openings.

Diagnosis.—The wide area of induration distinguishes this infection from a boil the rapidity of onset from specific infections and its circumscribed base excludes cellulitis.

Treatment.—Early hot packs or salicylic ointment are useful. After the base has broken down since the necrotic mass being coalescent, cannot escape from the small spontaneous openings as do the cores of boils, a crucial incision extending entirely across

the affected area should be made This should be managed as described in the paragraph on carbuncles of the neck.

Chronic Staphylococcic and Streptococcic Infection of the Skin

This infection begins as a small pustule usually on the forearm the dorsum of the hand or fingers As this opens spontaneously or is opened by incision, other pustules appear around the bor

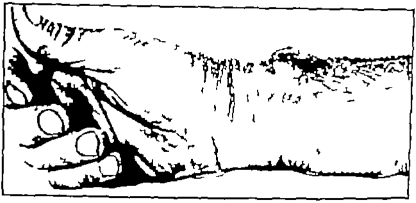


Fig. 369—Chronic abscess of the wrist following a slight infection.

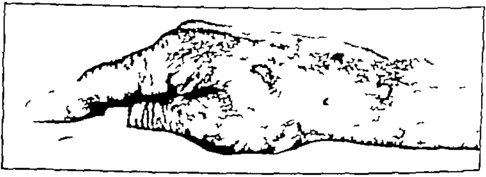


Fig 370—Chronic streptococcic infection of the wrist.

ders (Fig 368) These break down or ulcers form from which yellow pus may be expressed (Fig 369) Usually the under mining is slight and the lesions persist as flat superficial ulcerations. It is neither painful nor tender but spreads without evidence of healing The surrounding skin is reddened but not notably swollen The lesion may remain unchanged for many months unless cured by proper treatment. The streptococcic infection tends slightly to undermine the skin and to produce a serous exudate (Fig 370)

Diagnosis—Blastomycosis must be differentiated Blastomycosis forms a deep induration with little or no superficial ulceration and the lesions tend to form along the lines of lymphatics and not as separate lesions about the original ulcer as is the rule in chronic staphylococcic or streptococcic infections Finally the laboratory test may be relied upon to decide the question This is done by examining a drop of the pus in normal saline or 4 per cent potassium hydroxide for the characteristic sporothrix

Treatment.—When the skin around the ulcer is undermined, the borders must be split radially in order to expose the ulcerated area thoroughly All small pustules should be opened and cleansed with alcohol The wound should be cleansed daily with alcohol and a dressing of 10 per cent ammoniated mercury applied This results in speedy cure in the staphylococcic type Ulcers which have existed for many months often heal in a week or two much to the delight of the long suffering patient. The streptococcic variety are best treated by the application of tincture of iodine followed by a wet pack of equal parts of alcohol and saturated solution of boracic acid

Tuberculous Ulcers of the Skin

Uncommon as these ulcers are on the hand and arm they are important for if unrecognized they greatly annoy the surgeon as well as the patient They appear as deep reddish blue nodules on the skin which after the lapse of some months break down into sluggish ulcers with soft overhanging edges. These show little or no tendency to heal They are not painful and they show little inflammatory reaction.

Diagnosis—Their chronicity, their soft undermined border is very suggestive When pressed upon with a glass slide, small reddish brown nodules situated about the border of the ulcer can be discerned. These are tubercles and are diagnostic.

Treatment—These lesions are best destroyed with a cautery I have caused them quickly to disappear by injecting iodoform glycerin emulsion about and beneath them. When they are large this is better than cauterization, particularly when they are situated on exposed surfaces of the dorsum of the hand, because healing is secured with less scar

Paronychia or ' Run Around '

A paronychia is an aggravating little infection starting usually at the border of the nail from some slight injury or from a hang nail. An extremely small abscess forms at the side of the nail and if this is negelected the infection spreads to the base of the nail (Fig 371) and follows this around to the other side. Sometimes the infection is more intense and may reach the joint (Fig 372). Pus exudes from under the eponychium, the base of the nail is usually loosened from the matrix and is under

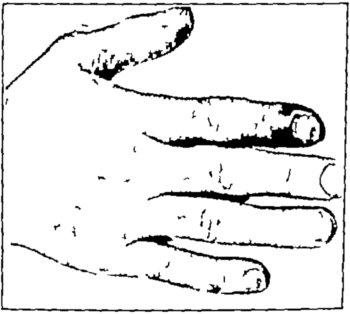


Fig. 371.—Paronychia about the base of the nail of the index finger

mined by pus. The infection remains almost indefinitely if not treated. Other nails may become infected in like manner.

Diagnosis—Small infections, local in character may exist unassociated with paronychia. The diagnosis cannot be definitely established until it manifests the tendency to follow the edge of the nail to its base. A lesion of much more serious character, namely melanoma of the nail bed, is sometimes mistaken for chronic infection (Fig 373). These appear as ulcerated lesions along one border of the nail and slowly undermine it. There is little or no pus production however and the surface shows brownish or black pigmentation.

Treatment—If an abscess forms at the side of the nail, it should be opened and drained and treated with iodine before the pus burrows to the base of the nail. It is useless to attempt to stay the process by the application of iodine about the nail after the base is once undermined. Radical treatment alone will secure results. Under novocaine anesthesia the eponychium

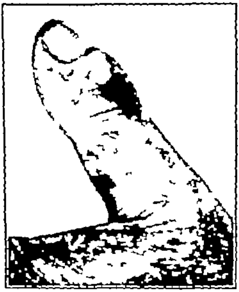


Fig. 372.—Paronychia involving the base of the thumb nail and extending backward and involving the joint.



Fig. 373.—Melanoma of the nail bed of the thumb

should be pushed back, the points of a sharp pair of scissors should be inserted under the loose edge of the nail and the base and all the undermined nail should be removed. Hot moist packs should be applied for a few days until the infection subsides, after which the wound is best treated with dry dressings. The part of the attached nail may be left until it is pushed off by the new nail

Lymphangitis

Lymphangitis usually starts from a small almost unnoticed injury, most frequently of the finger or palm of the hand, from a furuncle carbuncle or any purulent focus, or what is of more special interest to the surgeon, from a prick of a needle during the course of an operation Often the original portal of entry cannot be found The streptococcus is usually the etiologic factor, although various strains of staphylococci may produce it.

The beginning may be marked by slight malaise chilly sensations headache, or a definite chill There is usually dull pain extending up the arm with tenderness in the epitrochlear or axillary lymph nodes There is more or less edema of the dorsum of the hand and red streaks marking the course of the lymph vessels up the arm After a time these lymphatics may be palpable as solid cords lying just beneath the skin These cords may persist for many months after apparent recovery of the patient. The lymph nodes reached by these vessels are enlarged and sensitive to touch.

Mild cases may subside in twenty four to forty-eight hours or the condition may progress with abscess formation along the line of the lymphatics or lymph nodes or in rare instances along the deep lymphatics, producing cellulitis. Death may ensue from a general septicemia

Diagnosis.—The presence of a small wound, the rigor and fever the flush and swelling suggest the beginning of an erysipelas. After the red streak forms extending toward the axilla the diagnosis is easy Later on in the disease when small abscesses form along the line of the lymphatics sporotrichosis is simulated In sporotrichosis, however there is lacking the history of acute onset and the lesions are deeper and more indurated than the lesions following lymphangitis. In some instances the history is

uncertain and the lesion is confusing Then the microscopic and therapeutic test must be relied upon

Treatment.—If there is abscess formation at the point of entry of the infection or if an ulcer has formed, it should be cauterized The whole hand and arm should be kept wrapped in hot moist packs of aluminum acetate in formalin solution 1 to 2000 The moist heat is probably more important than the chemical used Mild infections often begin to subside in twenty four hours, but the condition may persist for many days. In that event the affected part should be subjected to the hot pack during the day only and at night it should be wrapped in a dry dressing and kept elevated well above the patient's head Should localized abscesses form along the course of the lymphatics, they should be opened. The epitrochlear and axillary lymph nodes should be drained if they suppurate but they should not be dissected out en masse as was once practiced by many surgeons for should infection again occur the patient would be deprived of their protection and there would be danger of a generalized septicemia This is important because it is just these streptococcic infections that are most likely to recur The patient should be in bed until the process subsides The dietetic and hygienic treatment should be the same as for any severe infection

Sporotrichosis

Sporotrichosis is an infectious disease due to sporothrix The infection usually gains entrance in a small wound of the hand A small subcutaneous nodule develops followed soon by the development of other nodules along the course of the lymphatics. They are at first painful but after a few days they soften and often break through the skin They then are less painful and discharge a greyish or brownish pus producing small fairly dense crateriform nodules (Fig 374) In other cases the course is more stormy There is fever and malaise and the lesions are larger and a wider area of skin takes part in the reaction and abscesses of some magnitude may form

Diagnosis—The course is more sluggish than lymphangitis with associated abscess formation and the lesions form anywhere in the course of the lymph vessels, and the glands are not notably

affected The affection is much more acute than tuberculous lymphangitis and also is more common

Treatment.—The use of iodides internally and an occluding ointment locally bring a speedy cure The purpose of the ointment is to exclude the air Mildly aseptic ointments, such as boric acid, are preferable since they tend to discourage the proliferation of the epidermal bacteria Occasionally old chronic lesions resolve slowly The injection of iodoform in glycerine, 5 per cent, causes them to disappear quickly



Fig 374.—Sporotrichosis showing ulcers left after incision of lesions.

Erysipelas

Erysipelas is closely allied to lymphangitis beginning in like manner Erysipelas instead of developing as a red streak appears as a reddened, indurated area with the characteristic raised border This disease is discussed in the chapter on General Infections.

Felon

A felon is an infection of the pulpy part of the distal phalanx (Fig 375) Entrance is gained through a scratch or prick of the finger The pulpy portion of the finger becomes swollen red and very tender to the touch The tenderness is more marked over the point of infection The pain is very severe and the finger throbs when the hand is held down The end of the finger becomes very tense this tenseness later gives way to fluctuation. If unopened the abscess points and drains (Fig 376) The blood vessels supplying the diaphysis of the distal phalanx become thrombosed and the bone dies (Fig 376) It is often found sur



Fig. 375.—Felon of the thumb.

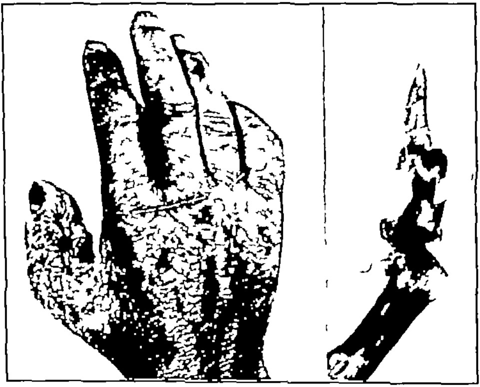


Fig. 376.—Late infection of the thumb. The distal phalanx is rarefied and the second is necrotic.

rounded by pus and in a child the diaphysis may be found loose floating in the pus In these late cases deformity of the finger always results from loss of bone

Diagnosis.—One must rule out localized superficial infection or a beginning lymphangitis in the finger In this the edema and tenderness is not localized in the distal phalanx, nor is there such extreme tenseness of this part. The intense pain attending a felon is characteristic

Treatment.—Fluctuation should not be awaited before opening a felon By an early incision much severe pain is avoided and the diaphysis of the phalanx saved As soon as the edema of the end of the finger changes to a hardness, the diagnosis is sufficiently established and the finger should be opened If seen early there may be a localized point of tenderness and the incision should be made over this If the tenderness is general over the whole end of the finger and the case is seen early an incision should be made on the side in a plane parallel to the longitudinal axis of the finger The incision should not be carried beyond the base of the phalanx or the tendon sheath may be opened and exposed to infection If the case is of long standing and the bone likely necrosed, it is better to make the incision along the palmar surface of the finger from its tip to the skin fold at the joint. If the diaphysis is dead it must be cut off with forceps. The wound should be lightly packed with gauze to provide free drainage

Deep Infections of the Hands

The deep infections of the hand are usually confined to certain regions notably tendon sheaths or the palmar fascial spaces, bursae on the palmar surface etc A brief review of the important points in topographic anatomy relating to this problem may, therefore not be amiss The tendon sheaths of the index, middle and ring fingers begin at the base of the distal phalanx of each finger and extend down into the palm of the hand approximately ¾ inch from the flexor cutaneous fold. The tendon sheath of the little finger begins at the base of the distal segment as the others and extends down into the palm where it becomes continuous with the ulnar bursa covers the flexor tendon in the palm of the hand and wrist and extends to an inch or more

above the annular ligament The tendon sheath of the thumb begins in the fingers and extending to the palm, becomes continuous with the radial bursa which covers the flexor longus pollicis and extends to an inch or more above the annular ligament.

Sometimes the radial and ulnar bursae are directly connected at the wrist, sometimes they lie in continuity and sometimes they are separated by one or two bursa which lie under the annular ligament

There are two important fascial spaces in the hand, one toward the ulnar side of the hand between the fascia covering the interosseous muscle and the flexor tendons called the middle palmar space and one towards the radial side of the hand under the adductor transversus and abductor pollicis called the thenar space

Infections from the middle ring and little finger tendon sheaths are likely to rupture into the mid palmar space while those of the thumb and index finger tendon sheath are more likely to rupture into and infect the thenar space Of course these two fascial spaces may be infected independently

Untreated infections of the tendon sheaths of the little finger may travel up the ulnar bursa and rupture above the annular ligament infecting the fascial spaces of the forearm or they may travel up the radial bursa to the tendon sheath of the thumb Infection of the tendon sheath of the thumb may also infect the tendon sheath of the little finger and ulnar bursa or the fascial spaces of the arm

Suppurative Tenosynovitis

Infection of the tendon sheaths may occur primarily as such the infection gaining entrance through a slight superficial wound or through a more extensive injury It may also occur secondarily to any abscess or a lymphangitis of the hand

The principal symptoms and signs of a tendon sheath infection are extreme tenderness limited to the tendon sheath severe pain on attempted extension of the finger the pain being more marked near the palm The finger is held rigid in partial flexion the whole finger is uniformly swollen the remaining fingers are held partially flexed but there is not much pain on extending them and they are not held rigid The whole hand is somewhat

tender and the back of the hand is usually swollen The pain which at first is severe usually grows less as the edema increases and may give way to a numbness or a tingling sensation If the sheath ruptures the pain and tenderness subsides for a time and might lead to the erroneous conclusion that the condition is improving

The constitutional symptoms are moderate fever, 100° to 103 prostration and loss of appetite These together with the loss of sleep occasionally quickly reduce the patient

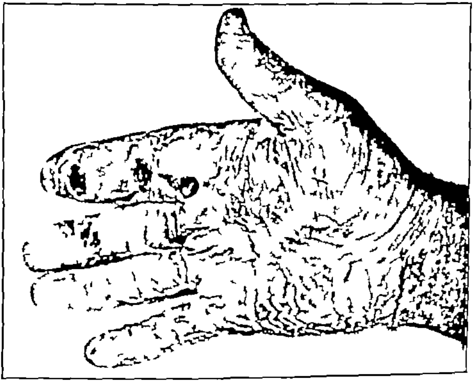


Fig. 3 7 —Tendon sheath infection in which three puncture openings had been made.

Extension of the infection is accompanied by a corresponding extension of the tenderness. The swelling is not noticeable in the palm on account of the heavy palmar fascia but if the radial or ulnar bursa is involved there is swelling above the annular ligament When the middle palmar space is involved the con cavity of the palm is lost and it may bulge and the edema of the dorsum of the hand markedly increases When the thenar space is involved there is marked swelling of the thenar area and of the web between the thumb and ind

Infection of the dorsal tendon sheaths is comparatively rare Infection is derived from direct injury or operative procedure and not from infections of the fingers. The condition is easily recognized because the tendon sheaths are more superficial Local tenderness swelling and pain on movement are the usual signs.

Diagnosis—The history of an injury or evidence of it, swelling and deep tenderness are the chief findings If there is pain on movement of the affected parts fever and general constitutional disturbance the nature of the trouble is certain Fluctuation should not be considered in the diagnosis.

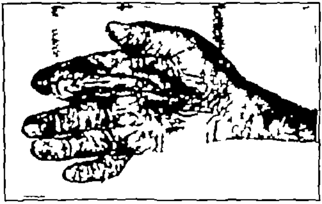


Fig. 378.—Adequate incision in the case represented in the preceding figure

Treatment.—Nothing is more common than to see these patients with numerous inadequate openings (Fig 377) The tendon sheaths should be widely opened as far as the infection extends (Fig 378) General anesthesia should always be used. The use of local anesthesia is too apt to lead to inadequate incisions. If extension has taken place to other regions these areas should be drained. If only the tendon sheaths of the fingers are involved, an incision the length of the sheath leaving a little bridge of tissue at the middle articulation to prevent prolapse of the tendon, is all that is necessary If the incision tends to close and prevent drainage an incision the full length should be made. *It should not extend over the distal phalanx.* If the radial or ulnar bursae are involved they should be incised down to the annular ligament at least. If the pus extends up the forearm, incise through the skin on each side of the wrist above the

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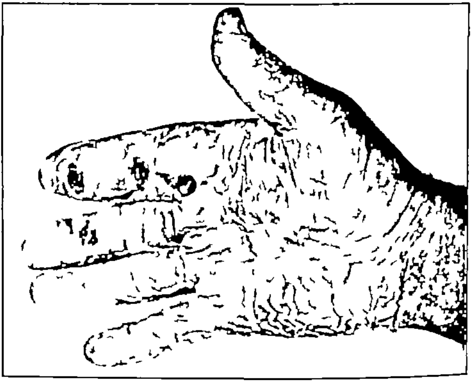


Fig. 377 —Tendon sheath infection in which three puncture openings had been made.

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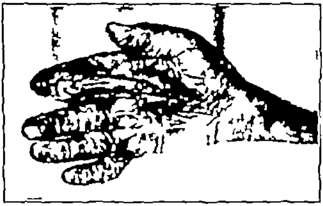


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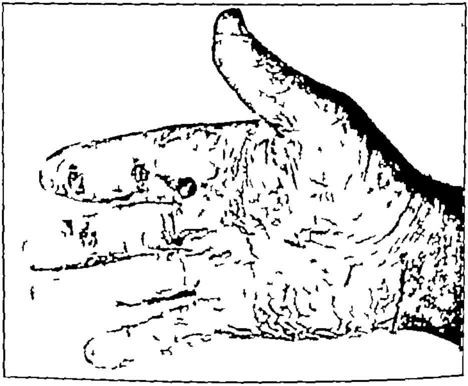


Fig. 377.—Tendon sheath infection in which three puncture openings had been made.

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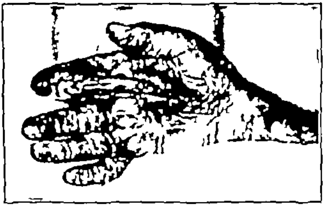


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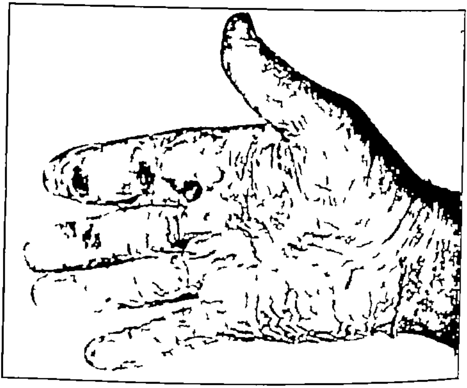


Fig. 377.—Tendon sheath infection in which three puncture openings had been made.

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ments of the fingers being made while the hand is in the bath. Exercises must be invented to exercise the fingers at fault. Constant use of the movement obtained is more helpful than exaggerated passive movements.

Fascial Space Abscess of the Hand

The middle palmar space lies between the flexor tendons and the fascia covering the interosseous muscles and communicates with the lumbrical spaces of the middle, ring and little fingers.

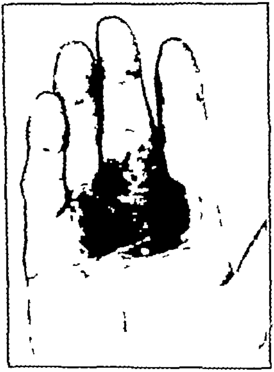


Fig. 379.—Localized palmar abscess.

Infection in this space usually follows small wounds on either of these fingers or the palm. Tendon sheath infections of these fingers may also rupture into it.

The principal symptoms and signs are pain, tenderness and swelling (Fig. 379) in the palm of the hand, obliteration of the concavity of the hand, often bulging of the palm and marked edema of the dorsum (Fig. 380). This is an edema that pits and not an induration such as is often found over pus. The fingers are held in partial flexion.

articulation and thrust a hemostat beneath the arteries, nerves and tendons and open the space wide Through-and through *drainage should be instituted. If*, as happens in neglected cases, the flexor tendons in the palm lie in a puddle of pus and the tendon sheaths in the wrist are involved one should not hesitate to cut through the annular ligament into the forearm as far as the infection extends. Once an infected tendon sheath has been entered the surgeon's finger will follow the course of the infection and wherever the finger goes, the incision must extend. Timidity has lost a hundred fingers where boldness has lost one

After adequate incision has been made, the wounds should be packed with gauze firmly enough to control hemorrhage. If spurting vessels are encountered, they should be ligated. After the danger of oozing is past these packs must be removed, usually *after twenty four to forty-eight hours* Whether wet or dry dressings are to be used depends upon the views of the surgeon. Usually as long as there is likely to be oozing the packs should be allowed to remain dry After the first dressing it is well to use wet dressings during the day and dry at night. If there is *a tendency of the infection to extend wet dressings* should be used from the start, preferably formalin 1 2000 As soon as the infection has subsided the edges of the wounds should be encouraged to fall together This may be encouraged by the use of adhesive tapes or even secondary sutures with silkworm put *in with the aid of local anesthesia*

If as unhappily so often is true, tendons become necrotic, they must be removed If a finger is left without tendons nothing can be done save amputation If the tendons are grey at the time of the operation the outlook is bad but they should not be *sacrificed until they spontaneously loosen*

After the acute symptoms have subsided a dorsal splint should be placed on the hand and wrist and the fingers extended as much as possible, this extension being increased a little daily until the fingers and wrist are fully extended Within three days *after operation gentle flexion and extension of* each joint should be made at each dressing and the patient should be urged to make early active movements thus insuring a more complete return of function of the hand After the wounds have *nearly* or fully healed hot baths may be resorted to exaggerated move

ments of the fingers being made while the hand is in the bath Exercises must be invented to exercise the fingers at fault Constant use of the movement obtained is more helpful than exaggerated passive movements

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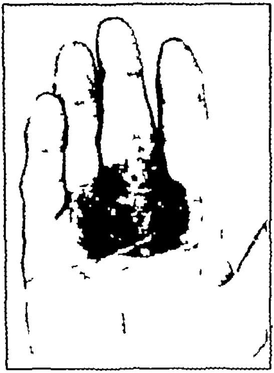


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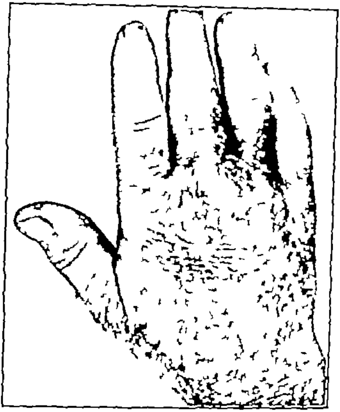


Fig. 220.—Dorsal swelling in localized palmar abscess.

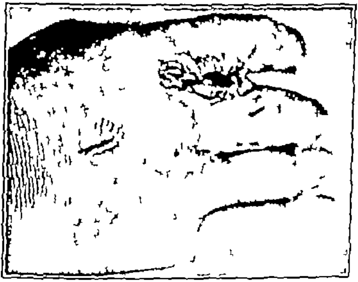


Fig. 221.—Fascial space abscess which pointed at the web. The surgeon opened at this point but neglected the palm.

The abscess follows the lumbrical muscles and points in the interdigital webs (Fig 381) This together with the edema of the dorsum often leads to erroneous incision in the dorsum of the hand or very small incisions into the interdigital web with inadequate drainage The middle palmar space abscesses may rupture into the ulnar bursa and so spread up the fascial spaces of the forearm

Diagnosis —The bulging and tenderness of the palm is the important thing The big boggy edema of the dorsum should not lead the surgeon astray The deep pain in the palm particularly

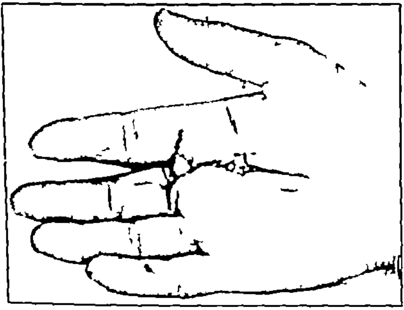


Fig. 38.—Proper incision in the palm of the case represented in the previous figure

if there has been a wound, is all but characteristic If there are constitutional symptoms bulging of the web, the diagnosis is proved. Small abscesses sometimes form between the skin and the palmar fascia. These do not cause pain when the fingers are moved. When incised the abscess is found just beneath the skin. Affections of the bones can be excluded by means of the x ray Tumors are not painful Tuberculosis of this region develops slowly and is little painful Tuberculosis should always be kept in mind for blunt trauma added to an unrecognized tuberculosis may leave a painful area To incise a tuberculous lesion is to invite secondary infection and real disaster, not infrequently ending in the loss of the arm

Treatment.—Until the diagnosis is made the hand should be kept in hot moist packs After an abscess has been diagnosed an incision should be made in the palmar surface along the lumbrical muscle most affected and carried down into the palm (Fig 382) A hemostat is then inserted under the tendon and into the space and spread widely Gauze should be packed into the incision and hot moist dressings should be applied for two to three days After this dry dressings suffice Passive and active movements should be instituted as soon as the acute inflammation begins to subside

Thenar Space Infections

The thenar space being on the radial side of the palm under the thenar muscles, is infected from wounds in the thumb and index finger as a rule There is bulging of the web of the thumb The hand is held in a characteristic position with the thumb and index finger slightly flexed and widely separated The abscess usually points in the dorsum of the web between the thumb and index finger It may point through a small opening the pus spreading out under the skin of the web, forming a small subcutaneous pocket of pus communicating with the larger one in the thenar space, making the so-called collar button type of abscess. This may lead to erroneous opening of only the superficial abscess. When neglected these abscesses may reach the mid palmar space, and when seen late, it may be difficult to say which was the area first affected. The history may be the only guiding factor The matter is of minor importance for both being infected both must be opened

Diagnosis—The bulging of the web and position of the thumb and finger are characteristic. When the palm becomes involved the symptoms of deep palmar abscess are added It is not a question of differentiation but of recognition of both lesions.

Treatment.—Incision should be made in the dorsal surface of the web and a hemostat plunged into the thenar space and separated widely A rolled rubber or gauze drain should be inserted and hot moist dressings applied for a few days, after which dry dressings should be used.

Abscess of the Dorsum of the Hand

Most infections of the dorsum of the hand are superficial due to a local infection and do not involve the tendon sheaths When the tendon sheaths are involved there is deep induration and pain when the fingers are moved Rarely the space may be infected by a palmar abscess pointing between the metacarpal bones. In such cases there is an induration over the back of the hand in addition to the edema of the palm belonging to the palmar abscess

Diagnosis—The diagnosis of deep abscess of the dorsum is nearly always wrong It is a common experience to find a drain in the dorsum of the hand making it look like a miniature steam boat while the palmar abscess goes on unmolested A deep dorsal abscess may be diagnosed only when symptoms in the palm are wholly absent.



Fig. 383—Tenosynovitis about the wrist. The center of the wrist presents a fusiform enlargement.

Treatment.—Infections of the dorsum must be widely incised as far as the infection extends Care should be taken, however not to invade uninfected areas

Tenosynovitis

Tenosynovitis is an inflammatory affection of the tendon sheaths. It follows a strain or excessive use of the fingers. There is *fusiform* swelling over the tendons (Fig 383) pronounced pain on movement and frequently crepitation on movement The last is characteristic.

Diagnosis—This condition must be differentiated from tuberculosis and gonorrheal arthritis It is of more acute onset than tuberculosis the swelling more spindle form and the pain on

movement more acute Gonorrhea is more pronouncedly articular more painful when the parts are at rest and usually there is other evidence of gonorrhea

Treatment.—Wet packs containing lead acetate bring much relief The *parts should be immobilized by an anterior splint.* From two weeks to several months are required for recovery to take place.

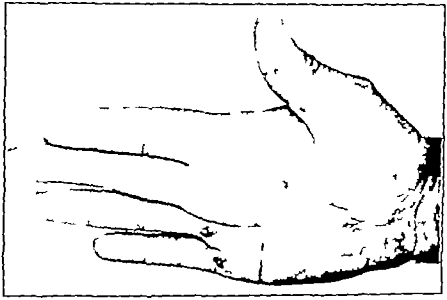


Fig. 384.—Tuberculosis of the tendon sheath in the palm. Note the oblong swelling proximal to the metacarpophalangeal joint of the middle finger

Tuberculous Synovitis

Tendon sheaths about the fingers and wrist are frequently affected by tuberculosis. *In the fingers they appear as fusiform* swellings about a tendon. In the palm they appear as oblong swellings (Fig 384) When all the tendons are affected, the entire palm of the hand *bulges When the tendons above the* annular ligament are affected there is a bulging of the lower forearm (Fig 385) When all these are affected pressure above the wrist may cause a bulging in the palm and vice versa. These swellings are circumscribed fluctuating or semifluctuating When rice bodies are found within, the grating of these may be felt as they move one upon the other When the wrist joint is the primary seat, the swelling is fusiform (Fig 386) not fluctuat

ing and more or less painful The affection is little painful spontaneously or on pressure when confined to the tendon sheaths.

Diagnosis.—The slow development the painlessness and possibly the presence of tuberculosis elsewhere establishes the nature of the disease Hygroma is not painful is less firm, does not have the rice body grating and is generally seen in healthy subjects



Fig. 383.—Tuberculosis of tendon sheath.



Fig. 384—Tuberculosis of the wrist joint.

Gonorrheal rheumatism is more painful more acute in onset more directly confined to the joint and often other evidence of gonorrhea may be discovered. In chronic tenosynovitis the entire wrist presents a fusiform appearance, the onset is acute, and there is frequently grating when the fingers are moved

Treatment.—When the affection is limited to the fingers an emulsion of iodoform and glycerin injected about the lesion re

sults in a cure When the palm and lower arm are affected the entire tendon sheath should be dissected out

Cellulitis

Cellulitis is a diffuse subcutaneous infection with a tendency to spread rapidly The infecting organism is often the streptococcus It starts usually from an apparently unimportant in jury such as the prick of a pin, nail, splinter or a small abrasion or an insect bite A bite from a human being is a fruitful cause and a cut from a beer bottle had its toll in the past. The first thing noticeable is a small, slightly tender red spot, which may

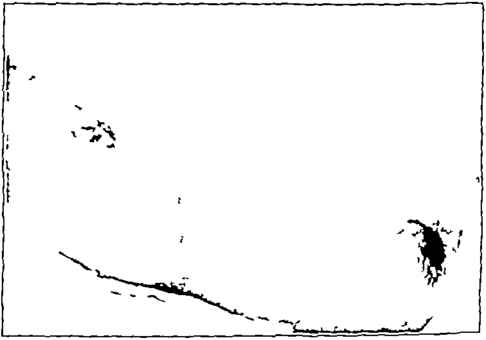


Fig. 387 —Ma ked cellulitis of the forearm and arm. A wide streak of lymph angitis can be made out and bullae are seen in the forearm.

be elongated with a typical lymphangitis This gradually extends until sometimes it involves the whole extremity The tissues become swollen and indurated resembling a limb in which ad vanced postmortem changes have taken place. The skin is red at first later turning to a bluish red Bullae may appear on the skin or there may be an area of necrosis (Fig 387) Fluctuation or localized abscess may appear A whole finger or extremity may become gangrenous from pressure if neglected. The con

stitutional symptoms are often marked Fever as high as 103° to 104° may be present and there may be pronounced prostration with delirium

Diagnosis—A differential diagnosis between this and erysipelas is sometimes difficult Cellulitis has a more diffuse border and the raised edge of an erysipelas is not present Again erysipelas may be the primary lesion and diffuse cellulitis follow secondarily The often enormous swelling may be indurated pitting on pressure Fluctuation must not be awaited before a diagnosis is made Too often the patient dies before fluctuation appears. The swelling brawny feel marked general reaction are sufficient to warrant immediate action

Treatment.—Very early in mild cases continuous hot moist packs may be tried in an effort to localize the infection If the spreading continues or the onset is stormy wide incision should be made in the most indurated area running the full length of the tissue involved If the swelling extends from the hand to the shoulder, the incisions should be that long Usually both anterior and posterior surfaces of the forearm should be incised the full length Small incisions are distinctly out of place If one waits for fluctuating abscess the patient usually dies before these appear The incision should be packed open and hot moist dressings should be applied and kept moist and hot until the inflammatory symptoms begin to subside One must be constantly on the alert for the extension of the process which will require renewed incisions. The incisions should be made under general anesthesia.

Suppurative Arthritis

Purulent arthritis is not common in the upper extremity It may follow accidental puncture wounds which enter the joint or when neighboring abscesses enter the joint as in neglected palmar abscesses or in generalized pyemia Primary suppurative arthritis is rare Infection of the joint is announced by pain and swelling increased on movement and by pressing the articular surfaces together The x ray may show the articular surfaces widely separated by fluid or it may later show some erosion of the cartilages.

Diagnosis.—Infections about the joint are differentiated with difficulty Distention of the capsule is the chief sign This to-

gether with evidence of suppuration makes the diagnosis probable If the region of a joint is involved in a pyogenic process, it is more apt to be in the joint than about it

Treatment.—The joint should be opened on both sides for through and through drainage The soft tissues must be kept separated to prevent too early closing It is always well to approach a joint cautiously If pus is encountered before the capsule is opened, one must make sure that there is also pus within the joint before the capsule is incised In palmar abscesses the carpal joints are occasionally involved. When the infection is of long standing the carpal bones may lie loose in a puddle of pus. Nothing remains but to remove them

Axillary Abscess

Though already referred to in a general way the infections of the axillary region require a special word. Axillary abscesses are of two types, the superficial, involving the skin glands chiefly, and the deep lying below the axillary fascia and caused by suppuration of the axillary lymph nodes The superficial ones are caused by infections entering through the sebaceous or sweat glands or through maceration of the skin by profuse perspiration and clothing that rubs and irritates. Many abscesses may form, extending over a considerable period of time The healing of these crateriform abscesses may produce considerable deformity (Fig 388) The deep type is a suppurative lymph adenitis, the axillary nodes receiving their infection from the lymph vessels draining the upper extremity or chest. Any infected wound of these regions may be the cause of an axillary abscess. The axillary space is large and filled with loose areolar connective and adipose tissue and infection from the glands tends to burrow through this The pain from a deep axillary abscess is severe limiting the movements of the shoulder joint and causing the arm to be held in abduction. The superficial infections often fluctuate early and open spontaneously With the deeper infections there is often a board like hardness of the axilla, with redness and extreme tenderness. The abscess may burrow under the pectoral or latissimus muscles before fluctuation appears

Diagnosis.—The superficial are easily recognized as subcutaneous lesions because of their pyriform elevations In deep ab

scesses there is general bulging and usually evidence of distal infection in the arm and hand

Treatment.—Axillary abscesses, both superficial and deep, are very resistant to treatment The superficial when opened often are followed by a new lesion requiring new incisions The axillary skin sometimes becomes filled with an infectious mass with sinuses. Removal of the whole block of infected tissue is required to bring about a cure

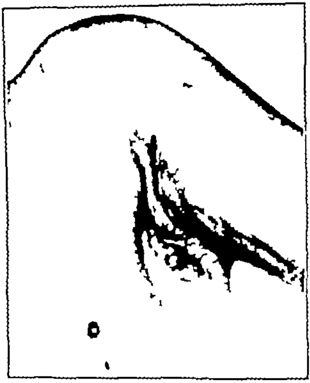


Fig. [illegible].—Chronic abscesses in the axilla producing marked induration.

The deep abscesses require early incision. This should be made close to the anterior border of the axillary space and parallel with it. Once the axillary space has been entered the infected tissue may be broken up with the finger Ample drainage must be supplied. This must be held in place by a suture otherwise it will not stay in place when the patient walks about Occasionally slowly forming abscesses require a long time for their healing The healing is expedited by a block dissection of the axillary contents, but this should be resorted to only if all other means fail.

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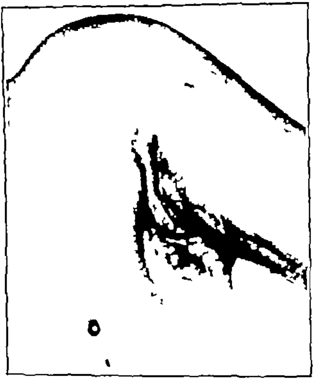


Fig. 311.—Chronic abscesses in the axilla producing marked induration.

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Supracondylar Abscess

A supracondylar abscess is really a suppurative lymphangitis of the epitrochlear lymph nodes. The organism causing it usually gains entrance to the lymph channel through some wound of the little or ring finger or ulnar side of the forearm. The nodes are frequently enlarged and tender The swelling disappears after the primary focus is healed or the lymph nodes may break down and suppurate even after the original focus of infection has healed.

Diagnosis—Swelling and tenderness when associated with a lesion of the hand establishes the diagnosis of infected glands. If the gland continues to enlarge and become more painful or the covering skin becomes more indurated after the primary lesion has subsided, the gland should be incised Awaiting fluctuation leads to unnecessary delay

Treatment.—When abscess develops, it should, of course, be opened and drained Dressings kept moist with a hot saturated solution of boric acid should be applied for the first twenty four to forty-eight hours, after which dry gauze dressings may be used.

CHAPTER XIX

INJURIES OF THE LOWER EXTREMITIES

Injuries to the lower extremity are seldom to be sharply defined from infections because the last usually follows the first. It is a matter of convenience only to consider separately those which at the time of observation are of recent origin and the traumatism is the dominant factor. When the injury is of minor importance and the resultant infection is dominant, it is convenient to discuss them as infections.

Frostbite

The injuries due to cold may be divided into three stages much the same as those due to heat. In the first stage of exposure to cold the part becomes first a bluish red and then white. When the cold ceases to act the part becomes a distinct red in color with some swelling of the tissue and sometimes a burning sensation. In the second stage bullae form over the exposed part. These contain a rusty colored serum. Later ulceration in the bullous covered area may follow. These ulcers are very sluggish healing very slowly.

In the third stage of exposure to cold there is a stasis and thrombosis of the blood in the vessels which lead to gangrene of the parts supplied by these vessels.

Diagnosis.—Usually the diagnosis of the condition and degree is easy. Caution is required, however, because the late consequences may be more severe than expected. This is particularly true when the exposure to cold is associated with constant moisture. Under these conditions what may at first appear to be a simple *frostbite* may proceed to gangrene. This may occur without any actual congestion of tissue having taken place.

Treatment.—In the first degree of exposure to cold the affected part should be rubbed with snow or rubbed while immersed in very cold water until the circulation returns. The part should then be bathed in 70 per cent alcohol. This prevents chilblains

and the alcohol should be applied whenever the part becomes red and itches The second degree should be treated as the first and in addition the bullae should be punctured and drained as they form Moist alcohol dressings should be applied to prevent infection. If ulcerations occur a 15 per cent ichthyol or balsam of Peru ointment is useful. For the third degree the part should be washed in alcohol and then wrapped in dry sterile dressings. The part should be kept as dry as possible with a sterile dusting powder When a line of demarcation definitely forms, amputation may be done Sufficient time should be allowed to elapse until one is sure that the part is really necrotic, for sometimes the skin only sloughs with retention of the underlying structures. In such instances a serviceable member may be secured by means of skin grafts

Burns

Burns on the feet are less common than those on some other parts of the body because of the protection afforded by the shoes. The front of the thighs and the region about the ankles are quite commonly subjected to this form of injury The degree of injury has already been described. Because of the less delicate underlying structures they are of less moment than in the hands.

Diagnosis.—The nature of the injury is obvious. Because of the extensive surface represented by the lower extremity, even superficial burns may be attended by danger to life

Treatment.—The treatment varies with extent and degree of the injury When superficial the burned parts should be covered with sterile gauze dressings and these kept constantly moistened with a saturated solution of sodium bicarbonate or dressings saturated with a 1 per cent solution of picric acid may be applied. If the burn is very extensive sodium bicarbonate is preferable to the picric acid as the latter is somewhat toxic. In extensive deep burns carron oil, consisting of a mixture of equal parts of lime water and linseed oil is to be preferred. If the burn is extensive shock should be controlled by giving full doses of morphine hypodermically sufficient to completely control the pain. Fluid should be given in large quantities by mouth and by proctoclysis and subcutaneously or even intravenously if the condition is urgent. After the sloughs have separated and

the granulations have begun to form drying by sunlight is the best treatment The dressings should be removed entirely and the wound exposed to the air The paraffin dressing may be used at this stage and is a very efficient method of treatment, but the parts on which it is used must be held practically immobile or the dressing will be displaced When the patient is in bed a cage of heavy screen may be made to fit over the area and keep objects from coming in contact with the wound Here, as in the upper extremities cicatricial contractures must be guarded against by means of splints

Contusions

Contusions of the lower extremities may occur at any point as a result of blows but are more frequently found along the anterior aspect of the tibia as the result of striking the leg against hard objects or of the foot caused by dropping a heavy object on it. Contusions may be accompanied by abrasion or hematoma or both

Diagnosis.—Contusions of the foot particularly should always be regarded closely, especially if the injury is caused by a heavy object being dropped on it lest a fracture be overlooked If any doubt arises, an x ray picture should be taken

Treatment.—For a simple contusion, if seen early cold compresses or an ice cap limit the exudation and no further treatment is necessary A saturated solution of lead acetate lessens the pain and reduces the swelling After the immediate disturbances are past bathing in hot water, with massage and perhaps the application of chloroform liniment may be used if the patient is apprehensive.

Abrasions

Abrasions of the foot may be caused by trauma or rubbing of the shoes The skin is particularly apt to be injured. The stubbed toe and skinned shin are quite normal conditions to the small boy Abrasions of the foot because of the rubbing of the stocking are likely to become infected They tend to heal slowly on the dependent parts of the body on account of a less active circulation than elsewhere They are sometimes the portal of

entry for serious infection and for this reason should not be neglected.

Diagnosis.—Abrasions are usually diagnosed from the history In older people diabetes should always be thought of and in the aged disturbed circulation may make a small abrasion a matter of concern. This is true also of those affected with varicose veins

Treatment.—Abrasions should be rendered aseptic by painting with tincture of iodine after which they should be covered with a dry sterile gauze dressing A better treatment, if the patient can be kept quiet long enough after painting the abrasion with iodine, is to expose the wound to air and sunlight and allow the exudate to dry and form a crust. An abrasion will heal much more rapidly under a crust than will one under a gauze dressing where the newly formed epithelium is macerated by moisture and rubbed off by the movements of the gauze dressings

Hematomas

Hematomas may be diffuse localized, having a definite clot in the tissues, subperiosteal or subungual. The first two are seen in the fleshy parts of the extremity, the subperiosteal where the bone is subcutaneous and the subungual as the name implies, under the nail. Hematomas follow contusions sprains, muscle rupture dislocation and fracture

Diagnosis—Subungual hematomas are easily recognized Those of the fleshy parts, particularly in the calf and thigh may appear as simple bruises until the discoloration reaches the sur face. The sudden appearance of a tumefied mass should lead to a diagnosis Superficial hemorrhages may long defy detection because the periosteum does not permit the blood to reach the subcutaneous tissues. A long enduring circumscribed tumor should suggest it as should also the very rapid appearance after the receipt of the injury

Treatment.—When seen within a few hours after the injury a bandage should be firmly applied to help check the hemorrhage and if it is definitely localized rather than diffuse ecchymosis, a pad may be placed over the growing fluctuating tumor and a bandage firmly applied over this The bandage must not be so firmly applied as to interfere with circulation. The patient

should be kept under close observation in order that this does not occur. One must remember that a bandage which is exactly right when applied may by continued swelling of the part become tight enough to completely stop circulation in the part distal to it. After the part has been bandaged for a few hours hemorrhage usually stops and the bandage may then be loosened. Diffuse ecchymoses disappear of themselves, but the process may be hastened if heat and gentle massage of the part are used after all danger of further hemorrhage is past. Localized blood clots

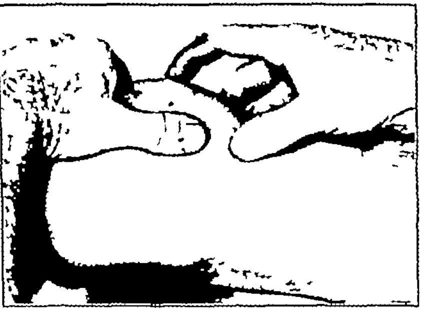


Fig. 283.—Hemorrhage into the knee joint. The joint capsule is compressed above the patella forcing the fluid downward. The index finger of the right hand then presses on the patella. If the fluid is present, the patella will have been raised from the condyles of the femur.

require a much longer time for absorption and are in danger of becoming infected. If large it is better to evacuate the clot through a small incision and obliterate the space it occupied by a pad held by a snugly fitting bandage. This must be done under strictly aseptic technic to avoid infection. Subungual hemorrhage should be evacuated through a hole drilled through the nail or if the hemorrhage loosens the nail completely it should be removed. Subperiosteal hemorrhages are checked by pad pressure and a tight fitting bandage and allowed to slowly absorb or after liquefaction takes place the serum may be aspirated.

Hemorrhage into Joints

Violent strains of the joint or direct contusion sometimes cause a hemorrhage to occur into them The swelling occurs rapidly and in a short time becomes stationary, it is limited to the confines of the capsule The knee and ankle are most commonly affected. Fig 389 shows the method of demonstrating fluid in the knee joint.

Diagnosis—Hemorrhage fills the joint cavity more quickly than an exudate and the outlines are more definitely obliterated. The pain is usually less than that caused by an acute inflammatory exudate The possibility of an associated fracture should always be kept in mind.

Treatment—Rest, mild compression by a bandage should be the treatment. Aspiration should not be undertaken because of the danger of infection Absorption usually takes place in a week or two without leaving any disturbance

WOUNDS

Incised Wounds

Incised wounds do not occur so frequently in the lower extremities as in the upper extremities but are likely to be more extensive because often produced by heavy tools and because the shoes protect the feet from all but very heavy blows. They may extend merely through the skin or deep enough to involve large blood vessels, nerves tendons and muscles.

Diagnosis—The wound is obvious enough the diagnosis has to do with the extent of injury to important structures. Injuries to tendons and nerves are of much less importance than in the case of the hand. Important joint surfaces are more likely to be injured in the foot which may lead to important infections.

Treatment.—Incised wounds, if very small, require only cleansing painting with tincture of iodine and a sterile dressing If larger and the skin edges tend to separate they should be sutured with a nonabsorbable suture material. If large vessels are cut these should be ligated, and if muscles, tendons, nerves, and fascia are cut, they should all be sutured. If heavy fascia over muscles or the fascia lata is cut this should be repaired

with chromic catgut to avoid subsequent muscle hernias. If the wound is deep, making injury to a joint possible, drainage with a gauze pack for a few days is a matter of prudence. All injuries of the lower extremity caused by objects which have come in contact with the soil should have a prophylactic injection of antitetanic serum.

Injury to Muscles (Myositis Ossificans Traumatica)

The muscles are injured usually only in extensive accidents. The extent of the injury, as well as the treatment required, is

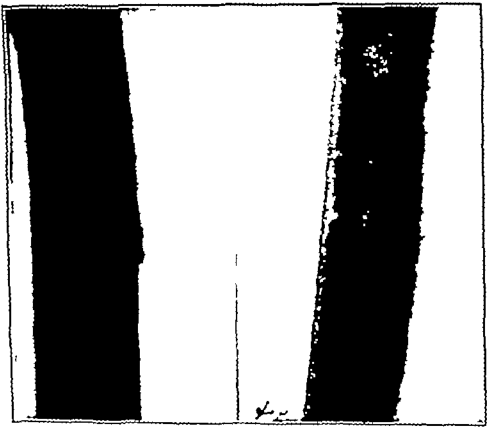


Fig. 199.—Early myositis ossificans following injury by a baseball. Duration in left picture two weeks and in right four weeks.

obrious. The blunt traumas are the ones which sometimes make important lesions. These are seen most commonly in football players. Following the injury an extensive exudation takes place which later ossifies. This is then known as myositis ossificans traumatica. A mass appears following an injury which in

from three to eight weeks shows definite bone structure on x ray examination (Fig 390) Later on this bone becomes dense (Fig 391) This is in part absorbed, but some remains permanently (Fig 392)

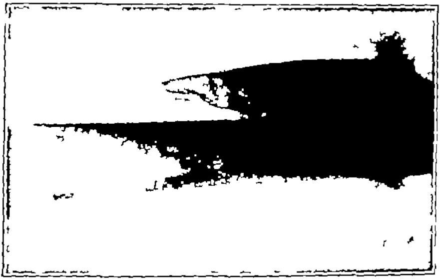


Fig 391.—Myositis ossificans traumatica following football injury

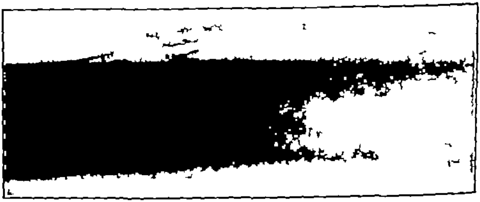


Fig 392.—Terminal stage of myositis ossificans three years after injury

Diagnosis.—The history of blunt trauma and the formation of bone in a short time is distinctive Sarcoma must be thought of but bone sarcoma does not form so quickly and in ossifying myositis the bone forms parallel to the long axis of the bone, while in sarcoma the bone radiates from the shaft.

Treatment.—Rest hot packs and massage is all that is required The condition tends slowly to improve though some bone formation may remain, partly disabling the muscle involved

Injury to Tendons

Incised wounds of the lower leg and foot especially those of the dorsum of the foot, are very likely to sever tendons The tendoachilles is particularly important and is a common injury

Diagnosis.—Flexion and extension of the foot and toes should always be tested to ascertain whether tendons have been severed When loss of motor power is present, the wound should never be sutured with the hope that normal function will return It is due to nerve or tendon injury and the exact extent of such injury *should be sought*

Treatment.—The ends of the severed tendons should be found, brought into apposition and sutured with chromic gut Securing the tendon may necessitate the enlarging of the wound and splitting of the tendon sheath longitudinally on account of the tendency of severed ends of tendon to retract After the tendons are united the sheath should be closed with fine plain gut The part should be placed at rest in such a position as to take the strain off the severed tendon

Injury to Nerves

Wounds of the thigh and upper leg are more likely to result in injuries than those of the lower leg and foot Injury to the nerve results in motor or sensory paralysis or both if the trunk is a mixed nerve trunk.

Diagnosis.—In the excitement over severe injuries the possibility of injury to a nerve trunk is likely to be overlooked The injury is often such that motor function cannot be tested The sensory function can usually be determined however which is a fair guide to the motor function.

Treatment.—The ends of the severed nerves should be brought together and sutured even if the injury of the nerve is not discovered for some days after the injury The technic of nerve suture is given in detail in the Chapter on Technic.

Lacerated Wounds

Extensive wounds are frequently caused by getting the parts into the gear or other moving parts of machinery or by being run over by heavy vehicles Fragments of dirt clothing grease and débris are often well ground together in such wounds

Diagnosis.—In extensive wounds the nature of the inflicting object must be considered When an extremity has been run over by a flanged wheel as that of a street car or railway train, the part is injured beyond repair *All other injuries should be diligently studied with the hope of saving the limb* If there is sufficient circulation, there is always a prospect. When in doubt it is best to follow a conservative course

Treatment.—All foreign matter should be removed and the wound rendered as nearly sterile as possible by the liberal application of tincture of iodine Pieces of tissue deprived of circulation should be cut away If the wound is small, it may be possible to reduce its size by suture It should never be completely closed. Some drainage should be provided If there is question of viability, dressing with wet packs for a day or two will decide this point If nerves or tendons are injured, they should be united if possible, but if this cannot be easily done, they should be left and a second operation done in which the tendon is lengthened. Whenever street dirt or barnyard soil has been ground into a deeply lacerated wound an immunizing dose of tetanus antitoxin should be given

Punctured Wounds

Punctured wounds occur most frequently on the sole of the foot, nails glass and sharp sticks being the principal offenders. Injury on the dorsum by sharp objects such as the tines of a fork is less common and less important. Perhaps 90 per cent of the puncture wounds heal without complication, yet the small percentage that is followed by serious purulent or tetanic infection makes them wounds which should be treated anything but lightly

Diagnosis.—The history of injury is significant. *The exact manner of injury should be determined*, as well as the nature of the object causing the injury Probing the wound is unsatisfactory, but unless it is known to be superficial, it should be assumed to extend below the fascia. This is most likely in injuries caused by glass or thorns and other wooden objects.

Treatment.—If the wound is superficial and is seen early the callus should be cut away from about it if present and the wound

should be swabbed to the bottom with tincture of iodine This may be done with a gauze wrapped probe Extensive cauterization with phenol or the cautery which is sometimes advised is not necessary The wound should be packed for twenty four hours with iodine soaked gauze and then allowed to heal If the wound extends below the fascia particularly if the object causing the injury is apt to be infected, the wound had best be enlarged to permit disinfection of the bottom and to assure drainage If the wound is too old for preliminary sterilization and there are signs of inflammation present, it should be placed in hot packs of 4 per cent aluminum acetate for an hour several times daily If abscess formation occurs drainage is necessary If fluctuation appears the incision should of course be made over it but if it does not, as is the case in deep abscess formation, incision should be made over the tenderest point If possible the incision should be held open with rubber drainage tubes

An immunizing dose of tetanus antitoxin should always be given if the object making the wound has been in contact with the soil

Gunshot Wounds

The common wounds of the foot are caused by the 22 caliber bullet which produces only a small perforated wound Not at all uncommon are the lacerating shotgun wounds made at close range In these wounds blood vessels and tendons are destroyed and usually bones are shattered. Besides the actual destruction of tissue with the resultant hemorrhage themselves often the cause of death gunshot injuries are often complicated by severe infections caused by bits of clothing and wads being carried into the tissues High powered rifles often make clean penetrating wounds

Diagnosis.—The location of the bullet is easily determined by means of the x ray In shotgun wounds the integrity of the circulation is the matter of chief concern

Treatment.—In rifle shot wounds where the bullet does not entirely penetrate the extremity the bullet should be located by means of the x ray and removed if it is easily accessible When the bullet is lodged in the tissue the wound should be sterilized with tincture of iodine and a sterile dressing applied. The

wound should not be probed Bullets often lodge in inaccessible places where they become encysted and do no harm. These need not be removed.

Shotgun wounds are often attended by alarming hemorrhage A tourniquet may be required to control the bleeding As soon as possible hemorrhage must be managed by ligature of the vessels Clothing and wads are often carried into the tissues if the wound is made at close range Shot remaining in the tissues need not be removed. They should be rendered as sterile as possible with tincture of iodine all foreign matter should be removed and the wound allowed to close by granulation.

Blank cartridges usually bury wads in the tissue and are serious only from the fact that they are frequently infected by the Bacillus tetanus. The wads should be removed and the wound treated with tincture of iodine. All cases of gunshot or blank cartridge wounds should receive an immunizing dose of tetanus antitoxin

Rupture of Tendons

The tendons of the lower extremity most frequently ruptured are the tendo achillis and the quadraceps. The tendo achillis is ruptured by violent exercise, such as jumping The symptoms are a sudden severe pain referred to the calf of the leg and inability to walk The quadraceps tendon is occasionally ruptured at the upper edge of the patella by falling with the leg acutely flexed The rupture extends into the knee joint and is often associated with hemorrhage into the joint. The symptoms and signs are severe pain, ecchymosis in the skin over the knee and inability to extend the leg

Diagnosis.—The sudden pain and the loss of function are suggestive. The absence of the tendon in its normal place establishes the diagnosis.

Treatment.—An open operation is indicated. When this can not be done the severed ends of tendons should be approximated as nearly as possible by means of full extension and traction by means of adhesive strips. Good results often follow this plan of treatment—better than those following open operation done under unfavorable conditions.

Wounds of the Knee Joint

Wounds of the knee joint may be mere punctures entering the articulation small incised wounds large lacerating wounds entering the joint or gunshot wounds They vary in severity from small relatively clean wounds to larger ones carrying clothing and dirt into the articulation

Diagnosis.—The chief difficulty is to determine whether the joint cavity has actually been penetrated If there is exposure of joint surface or escape of synovial fluid the diagnosis is easy In the absence of evidence the extent of the wound may be uncertain

Treatment.—Small puncture wounds of the knee joint are treated by *rendering the wound in the soft tissues as sterile as* possible with tincture of iodine and applying a sterile dressing The leg is held rigid by a splint The course must be carefully watched for evidence of infection within the joint If a large wound is made into the joint, any debris that has been carried in must be removed and the joint cavity should be irrigated with sterile normal saline The synovial membrane and soft *tissues should then be closed but a gap should be left in the* synovial membrane and a rubber tube inserted in the soft tissues leading from this gap to drain the joint A rubber tube should not be placed within the articulation They damage the articulation and lead to impaired function or complete ankylosis If a rise of temperature occurs extensive drainage of the joint is required

BURSITIS

Bursa about the foot knee and hip are sometimes the seat of inflammation and pain The affection is an annoying one and well worth attention

Prepatellar Bursitis (Housemaids' Knee)

This is an inflammation of the bursa which lies anterior to the patella. The most common is the traumatic type which occurs after work requiring long continued kneeling as in cleaning floors, hence the name housemaids knee They are painful in the beginning but when chronic, they cause no discomfort The

bursa merely becomes distended with fluid (Fig 393) The fluid is usually serous but may be blood tinged The acute cases subside in four to eight weeks if the cause is removed. Some become chronic and can only be successfully eradicated by excision of the bursa Occasionally they suppurate (Fig 394)

Diagnosis.—The condition must be differentiated from effusions into the knee joint. This is done by noting the fluctuating



Fig 393.—Prepatellar bursitis (housemaid's knee)



Fig. 394—Infected prepatellar bursitis.

swelling limited to the region of the bursa and by the absence of the floating patella.

Treatment—The extremity should be put at rest and adhesive strapping should be applied in such a way as to make the greatest pressure over the bursa (Fig 395) Many will disappear under this treatment. If absorption has not noticeably begun within a week the bursa should be aspirated and pressure by

adhesive strapping should be reapplied Aspiration should then be done every few days as the bursa refills and the straps should be reapplied Many cases resist this treatment and continue to refill, the walls of the bursa continually growing thicker In these cases the bursal sac should be dissected out When suppuration occurs they must be widely opened and the sac removed

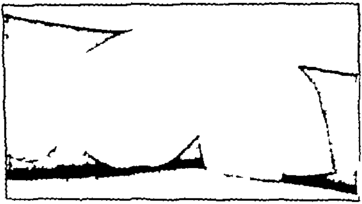


Fig. 39.—Method of applying adhesive strips in prepatellar bursitis

Subtendinal Bursitis

Numerous bursae about the knee may become affected The *most common sites* are under the sartorius and biceps tendons less commonly the gastronemius tendons The symptoms are pain and tenderness with the appearance later of a soft smooth swelling which when large enough may give a distinct fluctuation

Diagnosis.—Usually the location beneath a tendon makes the diagnosis probable Tumors of various sorts particularly early periosteal sarcoma may simulate a bursitis The x ray and aspiration should settle this point

Treatment.—Early cases may be benefited by counterirritation and pressure Long-standing cases must be dissected out

Subgluteal Bursitis

This type occurs in the bursa under the gluteus maximum muscle The *symptoms* and *signs* are pain on internal rotation of the thigh tenderness to pressure over the bursa and sometimes visible swelling

Diagnosis.—Swelling under the *insertion of the gluteus maximus* muscle is distinctive.

Treatment.—During the acute stages the treatment is rest of the extremity and the application of cold compresses. If the effusion persists, it may be aspirated. If it fails to clear up after several aspirations, it may be necessary to resect the bursa.

Tendo Achillis Bursitis

Tendo achillis bursitis is an inflammation in the bursa between the os calcis and the lower end of the achilles tendon (Fig 396) It is caused by trauma, often by heavy, ill fitting shoes The symp-

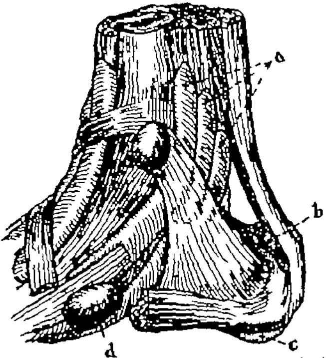


Fig 396.—Bursae about the heel lateral view a Bursae about the tendons of the tibialis posticus, flexor digitorum longus and the flexor longus pollicus. b Bursa of the tendo achillis. c Posterior calcaneal bursa. d, Anterior calcaneal bursa.

toms are pain in the back of the heel made worse by walking There is also local tenderness. Sometimes effusion is shown by a swelling in the region

Diagnosis—There is swelling under the tendon which may bulge distinctly on either side of the tendon

Treatment.—The treatment is complete rest A splint should be applied to hold the foot immobile at right angles until the pain and tenderness have disappeared The condition may become chronic and require excision of the bursa

Painful Heel

This is an affection usually found in heavy people whose occupation requires them to be on their feet a great deal It is an inflammation in the small subcutaneous bursa under the calcaneus. (Figs. 397, *b* and 396 *c*) It is often very tender to pressure and causes considerable disability

Diagnosis—Localized pain on deep pressure is diagnostic It must be distinguished from posterior calcaneal bursitis about to be described

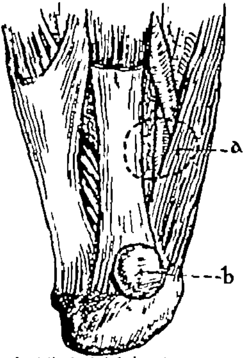


Fig. 397.—Bursae about the heel, inferior view *a* Anterior calcaneal bursa. *b* Posterior calcaneal bursa. This bursa should cover the greater portion of the bone.

Treatment.—The treatment is rest until the acute symptoms have subsided this to be followed by the wearing of an insole in the shoe with the part over this bursa cut out to relieve the bursa of pressure In persistent cases the bursa may have to be destroyed.

Anterior Calcaneal Bursitis

This is an inflammation in an inconstant bursa which when present is under the beginning portion of the abductor pollicis muscle extending laterally to the point of origin of the flexor

brevis digitorum (Figs. 398 and 397, *a*) Beneath it lies the sheath of the tibialis posticus, and the flexor longus hallucis and flexor longus digitorum lie lateral to it. The bursa is separated by these

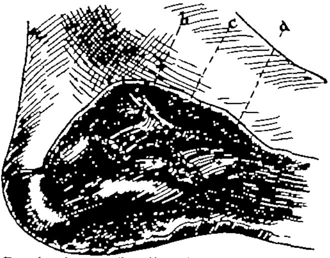


Fig 398 —Drawing from a dissection of the anterior calcaneal bursa. *a b* Ends of the severed adductor hallucis muscle. *c* The bursa lying beneath. *d* The edge of the flexor brevis digitorum. The bursa extends beneath this muscle.



Fig. 399 —Normal exostosis at the point of attachment of the flexor brevis digitorum.

tendons from the plantar ligament. The pain is located further forward than in painful heel rather more under the arch of the foot It is intense in character and there is extreme tenderness to pressure over the front of the heel No position relieves it.

Diagnosis—This condition must be distinguished from the pain of a broken arch In flat foot there is a change in the outlines of the foot and pain is often transmitted up the calf The exostosis often found on the os calsis (Fig 399) has been regarded as a cause of these pains This exostosis is a normal condition

Treatment.—An incision is made on the side of the foot and the bursa is destroyed with a small curette *An iodine gauze* pack is inserted for twenty four hours and the wound is allowed to heal

Anterior Plantar Bursitis

There are many bursae about the metatarsophalangeal articulations Two only will be mentioned here the metatarsophalangeal and the lumbrical Those situated about the tendons of the dorsum and those about the special tendons of the great and small toe may be disregarded By far the most important are the metatarsophalangeal bursae These lie as the name indicates between the metatarsophalgeal joints of adjacent toes They are easily demonstrated anatomically as pockets nearly a centimeter in diameter They *do not connect either with the joints or with the* adjacent tendons.

The lumbrical bursae surround the tendons of the lumbrical muscles (Figs 400 and 401) They are easily demonstrable anatomically but their involvement is difficult to demonstrate clinically When slight passive movements of the toes cause pain destruction of these bursae should be sought at operation

Symptomatology—Here again the acute and chronic must be separated. Here, more often than in affections of the heel, there is swelling and obvious increase in the heat of the part The pain is apt to be referred to other parts of the foot The entire area is sensitive to pressure and to passive manipulation Often there is a history of injury

In the chronic form there is complaint of pain when the foot is used in walking particularly after prolonged use Most often the outer part about the fourth toe is complained of The local findings may be slight out of proportion to the complaints of the patient. Usually manipulations calculated to cause one metatarsophalangeal joint to move against its fellow elicit pain, thus giving the surgeon information as to the area chiefly involved.

I have injected a local anesthetic into the suspected area. If the pain is temporarily relieved it eliminates the likelihood of the involvement of other bursae

Treatment.—In this situation the acute cases can be managed by nonoperative treatment—temporary use of the lead acetate pack with subsequent adhesive plaster immobilization. A small pad is placed in the hollow of the arch and the toes are held firmly together by an adhesive strip It is easy in this way to immobilize the parts producing the friction. Even in long standing cases this procedure often produced a lasting cure

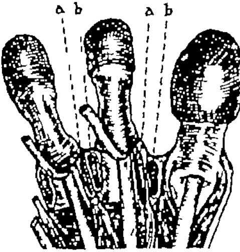


Fig. 400.—Bursae about the toes. *a* Lumbrical bursae. *b* Metatarsophalangeal bursae

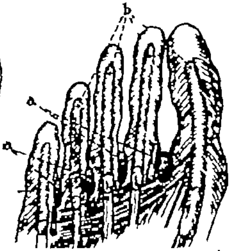


Fig 401—*a*, The metatarsophalangeal bursae. *b*, The sheaths of the flexor tendons of the toes.

In the chronic cases the bursae should be obliterated with a curette The skin is anesthetized over the metatarsal joint involved or in a line on either side if two incisions are to be made Two incisions make the operation easier After the skin has been infiltrated the deeper structures are anesthetized The bursae are freely curetted A small pack, as above described, should be inserted for a day If the lumbrical bursae are suspected, the area proximal to the joint and the area lying more deeply should be curetted One might say the head of the metatarsal bone may be separated from the surrounding tissues as if one intended to resect it and then not do it. Of course the joint is not opened and it is not necessary to separate the soft parts completely The foot is put at rest for a week by a tight circular bandage and then the patient may be allowed to go about

Subperoneal Bursitis

About the foot the most common site for a bursitis is about the peroneal tendons just beneath the malleolus (Fig 402) They appear as smooth rounded tumors usually painful in the beginning but slightly so when they become chronic

Diagnosis—Ganglia are sometimes found on the foot, usually on the dorsum (Fig 403) They are firmer and develop more gradually

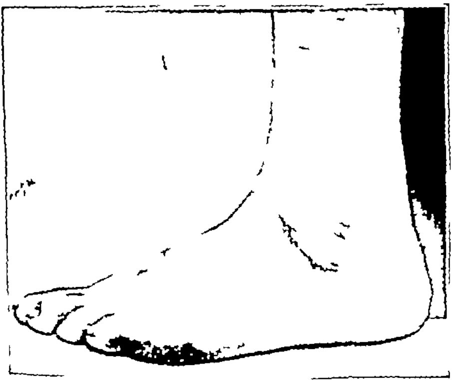


Fig 402.—Bursitis of the peroneus tendon.

Treatment.—When seen early strapping may be tried but usually operative removal must be resorted to Since the tendons are exposed rigid asepsis must be enforced

Loose Bodies in the Knee Joint, Displaced Semilunar Cartilages

Loose bodies in the knee joint and torn or displaced semilunar cartilage sometimes produce pronounced disability Usually the inner cartilage is the one injured Often definite injury precedes the displacement of the cartilage Loose bodies may occur as a result of the breaking off of marginal bony growths in

a hypertrophic arthritis These loose cartilages and loose bodies cause symptoms when they become imprisoned between the articular surfaces and lock the joint. The symptoms usually come on during violent exercise or some unusual movement, but may occur while the patient is walking The knee becomes locked in partial flexion and the patient falls to the ground because of the severe pain it causes Often there is an accompanying synovitis with effusion into the joint.



Fig. 403 —Ganglion of the dorsum of the foot.

Diagnosis.—Such a history always means a loose body or a torn or displaced semilunar cartilage In a displaced inner semilunar cartilage it may sometimes be felt protruding beneath the skin The x ray of the joint may show the location of the loose bodies, especially if they are calcified Often too these bodies may be felt at the borders of the articular surface

Treatment.—The immediate treatment of the locked knee is passive flexion of the leg followed by a gentle passive extension. If the cartilage protrudes, pressure over it at the time the movements are made will assist in replacing it The patient may readily be relied upon to tell one when the joint feels relieved, which means that the torn or displaced cartilage has been

smoothed out or replaced or the loose body has worked out from between the articular surfaces. An ether anesthetic may be necessary in extremely nervous persons during these manipulations. An elastic bandage applied figure of eight fashion about the joint may aid in preventing a recurrence of the displacement. If recurrence persists, an open operation for the removal of the disturbing objects may be necessary.

Acute Tenosynovitis of the Foot

Occasionally there is an inflammation in the tendon sheaths on the dorsum of the foot near the ankle exactly similar to that found in the flexor tendon of the wrist. The symptoms are pain on motion and a grating may be felt when the tendon slips through the sheath.

Diagnosis.—The swelling, pain on movement, and the grating when the tendons move are pathognomonic.

Treatment.—Wet packs of lead acetate should be applied for the acute pain. After a few days gentle passive motions and massage may be instituted. Immobilization should be maintained until after all pain on movement ceases.

SPRAINS

The lower extremity is subject to a variety of sprains, uncommon in the hip, less so in the knee, and very common in the ankle and the smaller joints of the foot.

Sprains of the Hip

When a sprain has occurred in the hip joint there is pain in the hip joint, aggravated by walking or passive motion. Some swelling may be present.

Diagnosis.—Suspected sprains must be differentiated from fracture about the hip joint, especially in elderly people. Fracture may be eliminated by means of the x ray. In children it must be differentiated from tuberculosis of the hip. The muscular spasm is greater in tuberculosis and the afternoon temperature is usually present. The x ray shows nothing early in tuberculosis but shows cartilage erosions and bony changes late

Bursitis is excluded by the absence of tenderness over the insertion of the gluteus maximus.

Treatment.—*Treatment consists in rest in bed with hot applications* to the hip joint. Gentle passive and active motion should be instituted as soon as the acute pain subsides.

Sprains of the Knee

Sprains of the knee occur as a result of a misstep or a fall in which the knee is twisted. The symptoms are pain, which is increased on flexion and extension of the leg. If the sprain is severe there may be an accompanying synovitis with effusion into the knee joint.

Diagnosis.—One must exclude rupture of the lateral ligaments and displaced or torn semilunar cartilages. Rupture of the lateral ligament is excluded by the fact that there is no lateral movement of the leg on the thigh when the knee is finally extended.

Treatment.—The treatment during the acute stage is rest in bed with the extremity on a posterior moulded splint with the knee in partial flexion. Hot packs to the knee help relieve the early pain. After the pain subsides the patient may be up on crutches still wearing the cast. After ten days to two weeks the cast may be removed and the knee strapped with adhesive. For slight sprains strapping may be the only treatment needed.

Sprain of the Ankle

Ankle sprains occur as the result of a misstep with inversion or eversion of the foot. They may vary from partial rupture of the ligament or a fracture of the tip of the malleolus at the insertion of the ligament to more extensive ruptures approaching actual dislocation. The pain may not be felt much immediately after the injury but soon becomes severe and sometimes unbearable. When caused by eversion of the foot pain is felt just below the external malleolus. There is usually puffiness about the ankle from serous exudate or hemorrhage.

Diagnosis.—In arriving at a diagnosis one must be sure to eliminate by means of the x ray fracture about the ankle especially fracture of the lower end of the fibula.

Treatment.—For the less severe cases strapping with adhesive is sufficient This should be worn several weeks For the more severe type the patient should be placed in bed with the foot elevated Hot applications of lead acetate and opium may be used for the severe pain When the swelling has reached its maximum and begins to subside the foot and leg should be placed in a plaster cast Massage and passive movements should be used early

CHAPTER XX

TUMORS AND DEFORMITIES OF THE LOWER EXTREMITIES

Most of the deformities and many of the tumors of the lower extremity fall outside the field of minor surgery Many of the major lesions, however must receive brief mention because of their close resemblance to less important diseases.

Corns

This lowly affection presents one of the sensitive points of contact in modern civilization. Laughed at or trod upon, it may sever ties of life long friendships. Therefore, when brought to us it should excite in us our gravest concern and receive our most solicitous attention. Corns are but callosities which form (Fig 404) usually over joints, from ill fitting shoes, never from shoes that are too small, if there is a disparity between the shoe and foot it is the latter that is too large. Corns cause pain by irritating the terminal nerve endings. They move freely over the underlying joint. When situated elsewhere than over a joint, as between the toes, the corn is soft, though made up as is the hard type of thickened epithelium. They are constantly moist and exceedingly painful Warts may occur on the dorsum of the foot (Fig 405)

Diagnosis.—Corns are corns obvious to anyone but if the term seems harsh they may be designated 'epiarticular hyperkeratoses." Our fair patients appreciate this little consideration of their sensibilities

Treatment.—Prophylactic treatment consists in having the patient wear properly fitting shoes. Shoes that pinch the toes or even those that are too large may cause the callus formation. Even when corns are present, the wearing of a properly fitting shoe will often cause them to disappear spontaneously The most universally used treatment for relief of the condition is to pare off the dense superficial layer so that the pressure on the



Fig. 401.—Corn on the second toe of the right foot and a like keratosis over the right metatarsophalangeal joint.

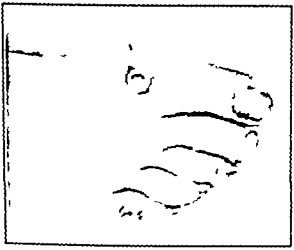


Fig. 402.—Corn on the dorsum of the foot at the base of the metatarsophalangeal joint and also on the fourth and fifth toes.

sensitive tissue is lessened Father's razor is the best instrument to use for this purpose Care must be used not to cause bleeding lest infection take place For temporary relief the felt corn pads with a central opening into which the corn fits acts very well but will not cure the condition The medical student will find adhesive plaster with a window cut in to admit the

corn (Fig 406 *B*) an effective way of removing pressure. This makes a convenient background when an ointment is to be used to remove the corn (Fig 406 *C*) The whole may then be covered with another strip of adhesive (Fig 406 *D*) A saturated solution of salicylic acid in collodion or in a 15 per cent ointment applied at night for a few days and then the feet washed in a hot solution of sodium bicarbonate will soften the corn sufficiently to

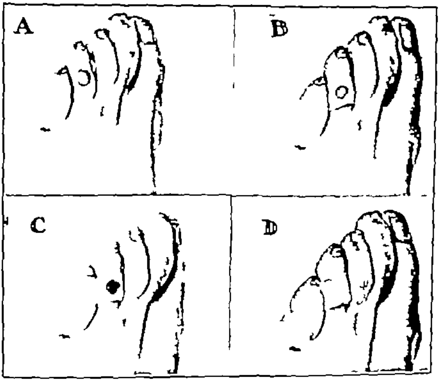


Fig. 406.—Treatment of corns. *A* Corn of the fourth toe. *B* An adhesive strip, with a window cut in to admit the corn, is wrapped around the toe. *C* The corn is then covered with salicylic acid, and then, *D* a strip of adhesive is covered over the window in the first strip, thus enclosing the ointment.

make its removal possible The central portion which extends deeper into the skin also should be removed A more elaborate preparation is as follows salicylic acid one and one-half drams, extract of cannabis indica one-half dram collodion one ounce This is applied as above indicated In some instances the entire corn may be excised particularly if the patient is to be kept in bed because of some more important operation Soft corns may be treated by soaking the feet in hot sodium bicarbonate solu

tion and then scraping off the macerated epithelium. A piece of cotton impregnated with boric acid powder should be worn between the affected toes.

Callus

Callus is a thickening of the epidermis of the sole of the foot caused by constant friction or pressure upon it by some hard object. Sometimes it is preceded by a blister but often gradu-

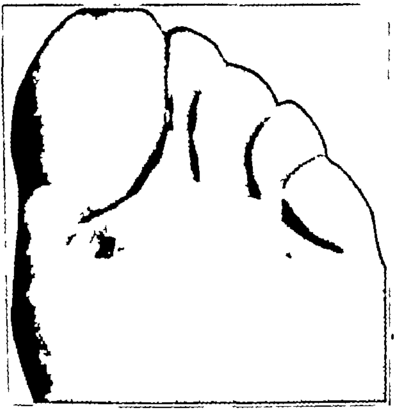


Fig. 407.—Callus of the sole of the foot presenting a wart-like center.

ally forms without previous injury. The common site for it is the bottom of the foot at the base of the great toe (Fig. 407). It is commonly present in foot deformities. In many cases this callus produces no symptoms and no treatment is necessary. In others the callus presses on the sensitive underlying skin, especially in persons whose occupation requires them to be on their feet.

Diagnosis.—The thickened tender area is diagnostic. Sometimes the center presents a particularly irritated and sensitive

area sometimes designated a corn These usually show a downward growth of epithelium and resemble warts (Fig 408)

Treatment.—The painful part of the callus should be covered with 15 per cent salicylic acid ointment, this being removed in the morning by scraping with a dull knife. This should be repeated each day for several days If flatfoot or other deformity is the cause of the callus formation, the correction of these may prevent its further formation Properly fitting shoes may also assist in preventing the return of the callus In cases where the callus returns the treatment must be repeated at intervals When a wart like center is present excision is the best treatment

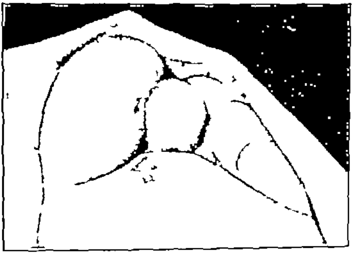


Fig. 408.—Plantar wart surrounded by normal skin.

In any operation on the sole of the foot it is best to begin the anesthesia on the dorsum and approach the sole from above. This causes much less pain than when attempt is made to anesthetize the thick sensitive skin of the sole.

Plantar Warts

These growths are seen on the ball of the foot usually near the big toe (Fig 408) and on the heel (Fig 409) They may be single or multiple They may be surrounded with callus with a small denuded area in the middle The papillomatous nature of the growth cannot be made out until this callus is removed. The epithelial thickening extends into the subcutaneous tissue

instead of outward as in an ordinary wart. These warts may be multiple (Fig. 409). They often cause pain when the patient is on his feet much.

Diagnosis.—An indurated area (Fig. 407) with or without the surrounding callus is characteristic. Perforating ulcers present a destruction of the entire thickness of the skin. Early melano-

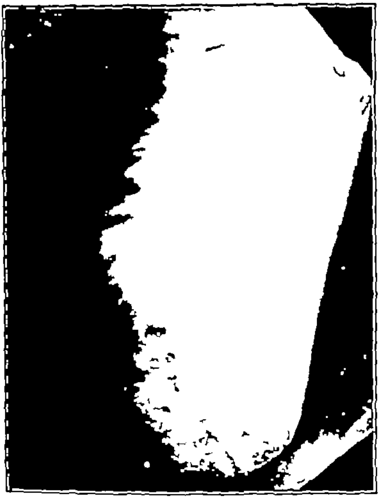


Fig. 409.—Plantar warts of the heel.

blastomas must be thought of. In these there is an ulcerated area in which a reddish wart-like border seems to be protruding through the skin. They are usually but little painful and sooner or later cause metastases along the line of the lymphatic vessels of the calf and thigh or the lower group of the inguinal lymph glands. After excision microscopic examination should be made lest the clinical diagnosis be wrong.

Treatment—The most successful treatment is excision by a circular incision (Fig 410) On account of the unyielding character of the skin of the plantar surface suturing should not be attempted but the wound should be allowed to heal by granulation



Fig. 410—Multiple plantar warts which have been excised.

Perforating Ulcer

This condition is characterized by a deep painless ulcer of great chronicity It usually is found in patients the subject of other diseases, alcoholism tabes syphilis diabetes etc. Therefore it is usually found in the middle-aged or old persons. Occult spina bifida may however account for such ulcers in young persons (Fig 411) Sometimes there is a history of trauma as the etiologic factor particularly in industrial practice These ulcers vary in size from one fourth inch to one inch or more in diameter The border is irregular and is often undermined and the surrounding skin may be calloused. The base is covered with dirty granulations Sometimes there is a sinus leading to the bone.

Occasionally a secondary infection causes some inflammation and there may then be some pain

Diagnosis.—The painless, sluggish character and great chronicity is usually characteristic. Sometimes the history is purposely



Fig. 411.—Perforating ulcer in boy of seventeen associated with occult spina bifida.

falsified and too much reliance cannot be placed on it. The presence of some chronic disease or spina bifida is important. From warts it is distinguished by the fact that in this condition there is an entire loss of substance of the skin. In melanoblastomas there is the tumorous like mass destroying the skin

and often there is metastasis along the course of the lymph channels or in the glands of the groin.

Treatment.—If the surrounding skin is thickened it should be removed with a salicylic acid ointment as described for corns. The ulcer may then be curetted and afterwards stimulated with iodine or balsam of Peru. Radical operation is not advisable. Usually no treatment avails much unless the patient is diabetic. In these patients the treatment of the underlying condition likely will result in the healing of the ulcer.

Melanoblastomas

Melanoblastomas are by no means minor lesions, yet in the beginning they appear so insignificant that they often are regarded as minor. They are melanotic in character therefore

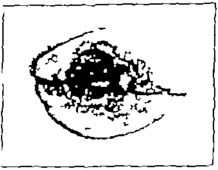


Fig 412.—Melanoblastoma of the sole of the foot.

among the most malignant tumors. Save in some of the papillary forms they invariably recur and are fatal sooner or later. In the simplest form they appear as small ulcerations through which a reddish papillary mass seems about to protrude (Fig 412). In more advanced stages the bordering skin is seen to be invaded by the tumor mass (Fig 413) and even where the skin has not been destroyed small nodules of tumor can be felt. Still more advanced a rounded mass protrudes boldly through the eroded skin (Fig 414 and 415). Very often even in early tumors beaded nodules may be felt along the course of the lymphatic vessels in the calf and in the popliteal space and in the inguinal region (Fig 416). Sometimes the inguinal lymphomas are discovered before the primary lesion. The protruding

variety often seen on the dorsum of the foot or the calf or thigh are less prone to form early metastasis (Figs 417 and 418)

Diagnosis—Whenever an ulcerous lesion is found on the sole of the foot these tumors must be thought of There may be no gross evidence of the presence of melanin and when seen early may resemble plantar warts or perforating ulcers

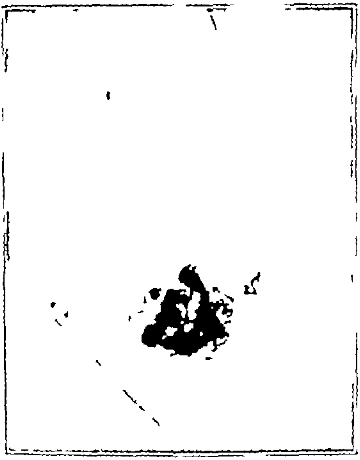


Fig 418—Melanoblastoma of the sole of the foot

Treatment.—The protruding type is cured by excision. The deep plantar type seem to recur despite any treatment. The x ray is useless wide excision and even amputation in my experience have been equally so

Sarcomas

Sarcomas are the most insidious lesions of the lower extremity A swelling or a bruise at first innocent may soon appear as a malignant growth. The xanthomas the so-called giant-celled

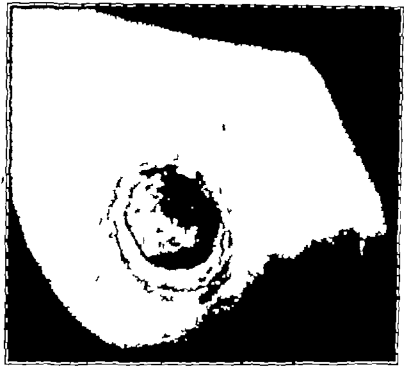


Fig. 414.—Melanoblastoma of the heel.



Fig. 41 .—Melanoblastoma of the lateral side of the great toe. This was treated as a soft corn with disastrous results.



Fig. 414.—Tumorous lymph nodes secondary to a small melanoblastoma of the foot.

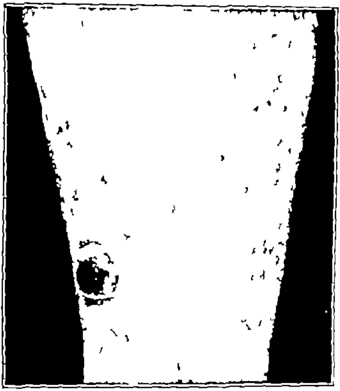


Fig. 417.—Melanoblastoma of the shin.

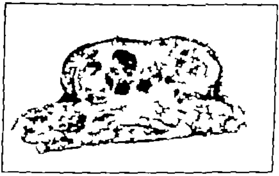
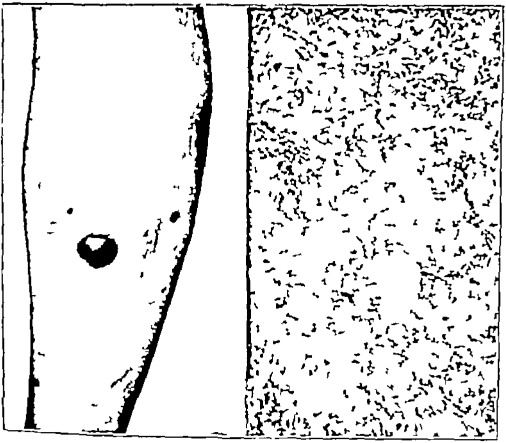


Fig. 418.—Section of the tumor shown in preceding figure.

sarcomas of tendon sheaths alone are minor lesions Small rounded tumors covered with a thin pinkish skin (Fig 419) are sometimes found on the lower extremity, usually about the buttocks. They long remain stationary but sooner or later take on rapid growth We call these bald headed sarcomas because of the character of the skin covering them Not uncommonly what appears to be a bursitis may soon appear as a periosteal



A B

Fig. 419 —Bald headed sarcoma of the calf. A Gross appearance. B Microscopic appearance.

sarcoma Blunt injuries of the thigh may cause malignancy Swellings of bone *should always suggest sarcoma* Myxomas are always to be classed in this group and any tumor in the popliteal abductor or upper thigh should be regarded as presumably malignant.

Diagnosis —Rapid growth and location in the regions indicated and of bone must be regarded as presumably sarcomas Syphilitic periostitis is often mistaken for sarcoma. The exceedingly

great pain at night, the periosteal thickening as seen on x ray and the prompt relief by antisyphilitic treatment quickly establish the syphilitic lesions

Treatment.—Treatment is radically surgical Small myxosarcomas may appear to be simple tumors leading to simple excision This is inadequate The capsule together with the tumor must be removed

Carcinoma

Carcinoma is not common in the lower extremity Primary cancer developing in the site of old ulcers is the most frequently found. Old varicose ulcers (Fig 420) or ulcers forming in old scars resulting from burns (Fig 421) are usually the starting point Carcinomas on the dorsum of the foot analogous to those of the hand, are very rare and present the same characteristics. They are slow growing do not extend deep and form late metastasis

Diagnosis—Carcinomas developing in old ulcers or in scars can be distinguished by the hard raised border and necrotic looking ulcer base In doubtful cases a section must be removed for microscopic study

Treatment.—Carcinomatous ulcers should be widely removed and the resulting wound covered by skin grafts or better still, by skin flaps if this is possible Those developing on old varicose ulcers are often so extensive that amputation must be done

Lipomas

Lipomas are occasionally found about the lower extremity especially near the hips They have the same general characteristics of lipomas elsewhere in the body except when they are found beneath the deep fascia When so located they can hardly be diagnosed before operation There is a type of lipoma of distinctive importance which is frequently seen in the adductors of the thigh They appear as ovoid tumors (Fig 422) and present the usual characteristics of lipomas. They are unusual in that they send interdigitations between the muscles in this region and may extend for long distances in the fascial planes. Lipomas are common just below Poupart s ligament and may extend



Fig. 4[illegible] [illegible] John [illegible] ulcer) [illegible] ulcer (So-called Mar[illegible]



Fig 421.—Carcinoma developing on an old scar resulting from a burn in child hood.



Fig 422.—Lipoma of the adductor region of the left thigh.

through the foramen ovale, when they are frequently mistaken for irreducible inguinal hernias

Diagnosis.—Usually the diagnosis is easy Those located in the adductor group may be difficult to distinguish from myxomas which also are common in this region (Fig 423) Differentiation may be impossible until the tumor is exposed at operation



FIG. 423.—Myxosarcoma of the adductor region.

Even soft sarcomas in this region may resemble lipomas. Those occurring below Poupart s ligament may be indistinguishable from irreducible omental hernias. Hernia and lipoma as a matter of fact are often associated

Treatment.—The treatment is surgical removal Those superficially located are easily removed, but those situated in the adductor groups should be regarded as major problems because frequently they are partly myxomatous therefore potentially malig

the adductor group of muscles and in the popliteal space (Fig. 424). Like the lipomas they extend along the muscle sheaths for long distances. When they form spheroid masses they are usually situated near Scarpa's triangle. Myomas must always be regarded as clinically malignant no matter what the microscopic examination may be.

Diagnosis.—These tumors must always be suspected when a lesion appears to be a lipoma. Often the diagnosis cannot be made until the tumor is exposed at operation. Rapid growth and pain always indicate myxoma.

Treatment.—Their operative removal constitutes major surgery. The surrounding tissues must be removed even though the tumor seems perfectly encapsulated.

Osteomas

Osteomas may develop anywhere along the osseous system of the lower extremity. Probably the commonest location is just above the inner condyle. The tumor grows out in the form of a curved exostosis pointing upward into the adductor group of muscles. They seldom cause symptoms other than the mental perturbation they cause the patient who can palpate them himself. They are sometimes mistaken for malignant growths. Similar exostoses may occur about any joint. Not infrequently they occur about the ankle in such a way that the movement (Fig. 425) of the joint is interfered with. Exostoses sometimes occur under the toe nails producing difficulty in wearing a shoe.

Diagnosis.—The slow growth, the density and smooth surface is sufficient to characterize them as benign.

Treatment.—When it is decided that they may be dispensed with they may be chiseled from their attachment to the bone. When from their size they produce interference with movements of the joints they must be removed. When developing under a nail, the soft tissues including the nail may be cut from them, raised up and the exostosis removed with a chisel. The soft tissues and nail may then be replaced and sutured.

Chondromas

Cartilaginous tumors of the lower extremities are confined largely to the bones of the foot. These may develop about any of the joint surfaces but are most prone to develop from the

astragalus They are slowly growing but tend to recur With each succeeding recurrence they are more apt to become sarcomatous.

Diagnosis.—The x ray makes the recognition easy

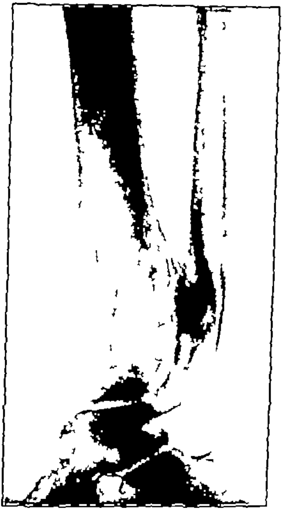


Fig 425.—Exostosis of the lower part of the tibia.

Treatment.—If the growth is rapid the bone from which they grow should be removed entirely Small, slowly developing tumors may be removed locally Such conditions should be carefully observed for possible recurrences.

Ganglion

This condition is not so common about the foot as about the hand and wrist, but it does occur particularly on the dorsum of the foot (Fig 426) They are sharply defined tumors arising

from tendon sheaths or communicating with articulations. They contain a clear viscid fluid.

Diagnosis.—Ganglia are sometimes so tense as to be with difficulty differentiated from fibromas or neuromas, particularly when situated on the tendons on the dorsum of the foot.

Treatment.—The treatment is excision. The same precautions must be exercised as when operating on those of the hand.

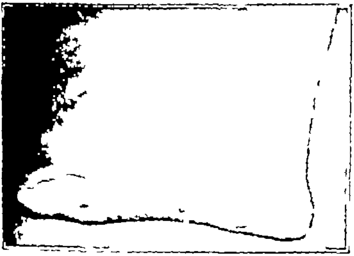


Fig. 426.—Ganglion on the dorsum of the foot.

Sebaceous Cysts

Sebaceous cysts are rare in the lower extremity. They are rounded or oval, sharply circumscribed tumors attached to the skin (Fig. 427). They may usually be rolled under it.

Diagnosis.—Because of the rarity one is apt to think of lipomas or other benign tumors.

Treatment.—The treatment is excision and complete removal of the sac.

Angiomas

Both lymph and hemangiomas are not infrequent on the lower extremity, both most frequently occur on the thigh. Lymph angiomas appear as superficial lesions, whitish, often blister like (Fig. 428). They lie within the skin and are movable with it. Cavernous lymphangiomas are seen about the calf and foot, less often on the thigh. Hemangiomas present bluish lesions, often elevated and always compressible (Fig. 429). When these are



Fig. 42 —Sebaceous cyst in the tibial region.



Fig. 428.—Lymphangioma of the perineal region.

situated near the perineum they may be connected with like lesions within the pelvis

Diagnosis —The lymphatic tumors are easily recognized if some of the superficial tumors are translucent Otherwise the nodulations, long duration and stationary character is usually characteristic The hemangiomas are easily recognized because of the color and compressibility

Treatment —The lymphatic tumors are best excised The vascular tumors may be excised if small or may be obliterated by the



Fig [illegible]—*Hemangioma of the buttock*

cautery Those about the perineum with intrapelvic connections are distinctly major problems

Talipes

Talipes or clubfoot may take the following *forms* talipes equinus, or the *foot* in permanent extension making the patient walk on the toes talipes calcaneus or the foot in permanent flexion causing the patient to walk on the heel talipes varus or adduction of the *foot* and talipes valgus or abduction of the foot Combination of two of these is most common



Fig. 427.—Sebaceous cyst in the tibial region.

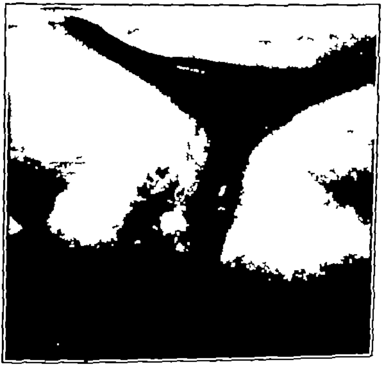


Fig. 428.—Lymphangioma of the perineal region.

situated near the perineum they may be connected with like lesions within the pelvis

Diagnosis—The lymphatic tumors are easily recognized if some of the superficial tumors are translucent. Others use the nodulations, long duration and stationary character is usually characteristic. The hemangiomas are easily recognized because of the color and compressibility.

Treatment—The lymphatic tumors are best excised. The vascular tumors may be excised if small or may be obliterated by the

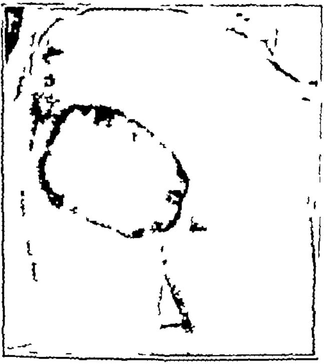


Fig. [illegible]—Hemangioma of the buttock

cautery. Those about the perineum with intrapelvic connections are distinctly major problems.

Talipes

Talipes or clubfoot may take the following forms: talipes equinus, or the *foot in permanent extension making the patient* walk on the toes; talipes calcaneus, or the foot in permanent flexion, causing the patient to walk on the heel; talipes varus, or adduction of the foot; and talipes valgus, or abduction of the foot. Combination of two of these is most common.

The causes of talipes are congenital and acquired. The congenital talipes is often associated with spina bifida. It may be unilateral or bilateral The acquired talipes is most frequently caused by infantile paralysis, or any muscle injury causing contractures of the muscle on the anterior or posterior portion of the leg may cause it or lying for a long time with the foot in abnormal position following fracture of the extremities or extended illness or bad application of casts may cause contractures resulting in clubfoot.

In long-standing or severe cases the tarsal bones may be markedly altered in shape or ankylosis may take place between some of them Tendons may be misplaced and muscles and fascia abnormally *shortened or lengthened. There may be calluses and* corns in unusual locations on the foot.

Diagnosis.—The deformity is obvious. The underlying condition must be considered, whether congenital the result of occult spina bifida, or the result of disease or injury All these considerations are important in outlining the treatment. In many instances the original disease is complicated by injudicious operation.

Treatment.—The treatment is manipulation or operative In congenital cases taken early that is at one year or younger, the feet should be moulded back into their normal positions and held by the application of plaster bandages Skillful orthopedists secure excellent results even up to adult development by this method Anesthesia is necessary The normal position cannot be achieved at one manipulation but whatever progress is made is held by plaster bandages The moulding may be done at intervals of a few weeks After the normal position is acquired and held for a few months shoes with braces running up the leg may be used for a few months but usually they are not necessary

If the child is older than a year und tendon contractures are present, tenotomy or tendon lengthening may be necessary in combination with manipulation. In the older cases division of plantar fascia and lengthening of flexor or extensors of the foot together with plaster casts is necessary

In cases in which the bones have undergone changes of form, tenotomy and fasciotomy are useless. In these cases it is necessary to take out wedge-shaped pieces of bone in the proper place

to correct a deformity The foot must then be held in over corrected position in a plaster cast for several months

In paralytic cases unless the ankle and some tarsal joints are ankylosed, braces of some kind must be permanently worn or the tibial astragalus joint obliterated

Flatfoot

Flatfoot may take two forms, a flattening of the longitudinal arch with abduction and eversion of the foot or a flattening of the transverse arch Flatfoot may be congenital or it may be

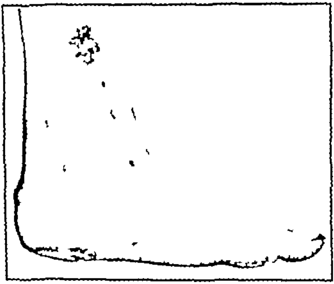


Fig. 430 —Flatfoot. The longitudinal arch is entirely obliterated.

caused by poorly fitting shoes, by any illness or injury which weakens the muscles or ligaments controlling the foot, by occupations requiring much standing especially if the person is youthful and heavy by sudden rapid increase in weight, by infantile paralysis and rickets The transverse arch is frequently flattened by athletic contests or gymnastics which necessitate jumping and alighting on the toes or ball of the foot Short shoes with high heels also cause it The symptoms of flattening of the longitudinal arch may vary from no symptoms at all to pain in the sole of the foot through the arch or extending up the leg sometimes causing a lumbar backache

Flattening of the transverse arch Morton s disease or meta

tarsalgia gives the symptoms of severe pain in the region of the distal end of the third and fourth metatarsal bones.

Diagnosis—The diagnosis is made from the symptoms and the deformity The extent of deformity, however, does not bear any relation at all to the intensity of the symptoms. The deformity noticed when the patient stands with shoes and stockings re moved is that the inner border of the foot is lengthened and rests on the floor for its entire length (Fig 430) The foot is abducted and everted. The achilles tendons instead of coming straight down curve outward at their lower end. The internal malleolus and head of the astragalus are more prominent than normally An impression of the foot taken on a piece of cardboard covered with lamp black shows the obliteration of the longitudinal arch.

Treatment.—Treatment of longitudinal arch flattening con sists of proper foot strapping properly fitting shoes and exer cises The best method of strapping is that advocated by E H Oschner which is as follows the leg is shaved and washed with alcohol and ether to render the skin free from oil Five or six adhesive strips an inch wide and long enough to reach from just below the knee on one side around the foot to just below the knee on the other side and about six strips an inch wide and long enough to reach from the base of the toes on one side around the heel to the base of the toes on the other side are used Strips 2½ to 3 inches wide are then cut long enough to almost encircle the extremity and to extend when overlapped from the instep to the top of the longest strap

The foot then is held at right angles to the tibia and slightly adducted and inverted (Fig 431 A) A long strap is then started on the outer side of the leg below the knee toward the posterior part of the leg It is brought around the heel or as close to the Achilles tendon as possible pulling the foot in and stretching the other end of the strip in a corresponding position on the inner side of the leg One of the shorter one inch strips is then started at the base of the little toe following the sole closely around the heel and fastened near the base of the great toe (Fig 431 B) The long and short strips are then alternately applied, each slightly overlapping the other, the long and short making a basket weave about the ankle (Fig 432) After as many are applied as can be and this is usually five or six the inch strips

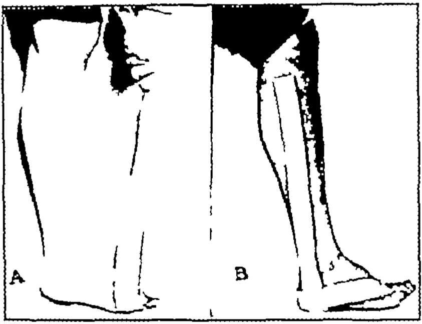


Fig. 431.—Treatment of flatfoot. *A*. The foot is held adducted by means of a gauze bandage. While being held in this position, adhesive strips are applied, *B* as described in the text.

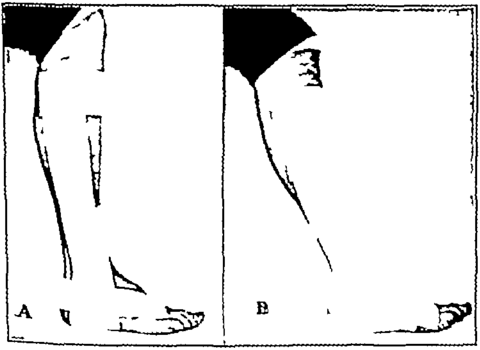


Fig. 432.—Treatment of flatfoot. *A*. Additional strips are applied. *B*. Short strips are passed circularly but do not meet behind.

are applied over the front of the instep and leg, their ends lacking about two inches of meeting behind the leg while on the foot they extend to the sole (Fig 432-*B*) A firm gauze bandage is then applied to make the adhesive adhere firmly to the skin.

The strapping must be changed whenever it loosens and must be worn from two to six months or even longer A properly fitting shoe should then be worn. This means one long enough *and broad enough that it does not pinch the foot* The heel should not be over 1¼ inches high and the inner edge of the sole should form a straight line The inner side of the sole and heel may be built up a little to throw the weight on the outer border

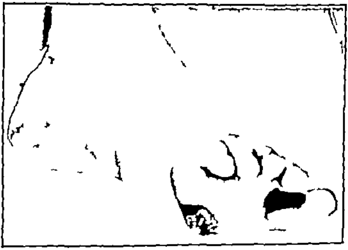


Fig 433 —Treatment of weak transverse arch by means of a felt pad and adhesive strip.

of the foot This in itself is often sufficient to cure a mild case of flatfoot.

Exercise should consist in developing the muscles of the foot and leg The toes should be plantar flexed at each step that is *dug into the sole of the shoe at each step* The daily exercise of standing with the toes pointing straight ahead and raising on the toes a number of times strengthens the calf muscles. A person with flatfoot should also guard against toeing out when walking and should walk with the toes pointing straight ahead.

Treatment of transverse arch flattening consists of wearing a small felt pad under the transverse arch in about the region of the distal end of the third metatarsal. This may be strapped in place with adhesive (*Fig* 433) It must not be over three-fourths

inch wide as a rule. If it is made too thick it will increase the pain. It may be thin at first and then be gradually thickened with each change of the support. A wide band of elastic worn around the foot over the distal ends of the metatarsals also helps relieve the pain. The same advice as to shoes and exercise is applied to this type of flatfoot with the exception that it is not necessary to build up the heel and sole.

Hammer Toe

This deformity may be congenital, may be caused by short narrow or pointed shoes, or may be associated with other de-

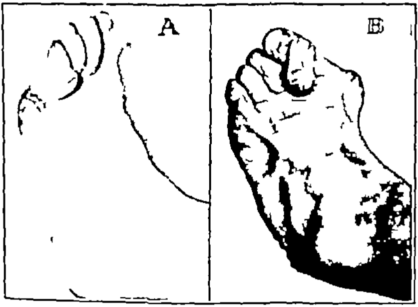


Fig. 434.—Bunion. A, Over the metatarsophalangeal joint of the little toe. B, Classical bunion over the metatarsophalangeal joint of the great toe. The second toe is a typical hammer toe bearing a corn.

formities as hallux valgus or talipes equinus. The condition consists of a permanent hyperextension of the proximal phalanx, a flexion of the middle and either a flexion or extension of the distal phalanx (Fig. 434-*B*). The only symptom is pain due to pressure over the articulation between the proximal and middle phalanges as from the corn which usually forms over it. The patient rarely comes for treatment until the deformity is marked.

Diagnosis.—The condition is obvious at a glance.

Treatment.—One form of treatment is the reversing of the shortened tendon and fascia producing the deformity correcting it and then holding the toe extended with strips of adhesive interwoven between the toes (Fig 435) This may be tried but no favorable prognosis can be given The amputation of the toe back of the metatarsophalangeal articulation is the operation of choice.

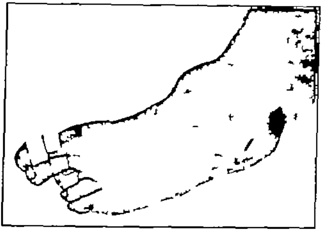


Fig. 435—Treatment of hammer toe by means of interweaving strips of adhesive.

Metatarsophalangeal Bursitis (Bunion)

This is an inflammation in the small subcutaneous bursa situated over the articulation of the metatarsal and proximal phalanx of the great toe It is usually caused by trauma inflicted by narrow ill fitting shoes Even though the leather is soft if the shoe is narrow the condition may result The pain in the acute stage is severe and throbbing making walking almost impossible The condition often becomes chronic finally exciting the head of the metatarsal to enlarge displacing the great toe lateralward (Fig 434-*B*) This condition is termed bunion or hallux vagus. Less often they occur over the tarsometatarsal joint of the little toe (Fig 434-*A*)

Diagnosis.—Tenderness over this joint is usually associated with a reddening of the skin which makes the condition quite characteristic The deviation of the toe is obvious at a glance in marked cases

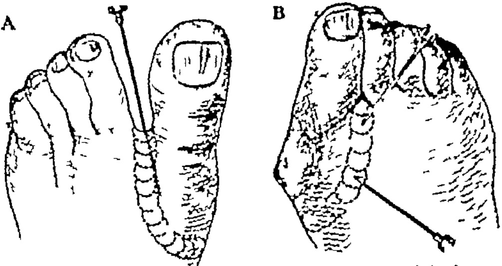


Fig. 436.—Infiltration for excision of bunions. *A* The skin of the dorsum is infiltrated and the needle passes along the lateral surface of the metatarsal bone to reach the nerves in this location. *B* The needles are passed through the original line of infiltration to reach all the tissues about the joint.

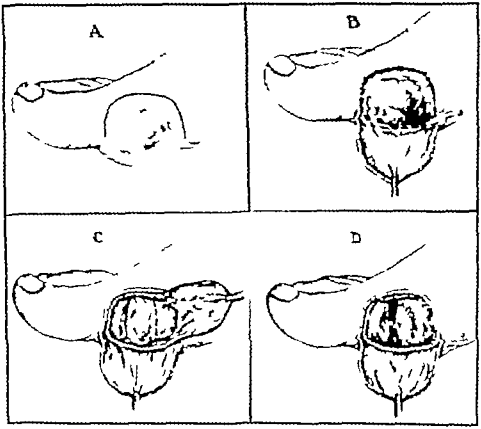
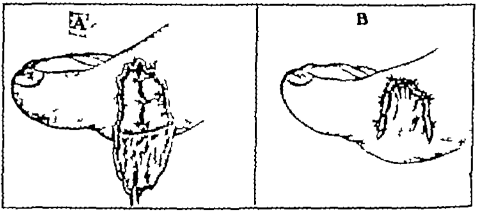


Fig. 437.—Operation for bunion. *A* Line of incision through the skin. *B* Dotted line indicates the extent of flap deflected upward. *C* The dotted line shows the extent of bone removed. *D* The flap dissected in *B* is drawn over the end of the bone after resection of the head.

Treatment.—During the acute stage all pressure should be removed from the bursa by the wearing of a soft slipper until the pain and tenderness have disappeared. After this the bursa should be protected by a bunion pad when the shoes are worn or the shoe cut to relieve the pressure over it If the condition persists, the bursa gradually thickens and should be excised If the bursa becomes infected during the acute stage, it must be widely excised and packed with gauze. After a hallux vagus is present, the only treatment is resection of the head of the metatarsal bone. The operation is done as follows The skin is infiltrated about the joint beginning in the thin skin of the dorsum of the foot (Fig 436-*A*) the deep tissues are infiltrated through



438.—Completion of bunion operation. *A* The free edge of the capsule below is attached to the capsule over the lower end of the metatarsal bone. *B* Skin flap stitched in place, without trimming, with staple sutures.

this line (Fig 436-*B*) A semilunar incision is then made through the skin and the flap dissected downward (Fig 437 *A*, *B*) The bursa and the lateral ligament are deflected upward (Fig 437-*C*) The head of the metatarsal bone is then cut off (Fig 437-*C*), the flap previously made from the lateral ligament is then turned over the severed end of the bone (Fig 437 *A*) The anterior part of the ligament is then sutured to the base of the flap (Fig 438-*A*) The skin is sutured into place (Fig 438-*B*)

Ingrowing Nails

This aggravating lesion is due to an infection of the soft parts about the borders of the nails, usually the great toe, due to a deformation of the nail causing its edges to burrow into the soft

parts The result is that exuberant granulations spring up along the border of the nail still further imbedding it One border alone (Fig 439) or both borders (Fig 440) may be involved.



Fig. 439 —Severe infection with loss of nail.



Fig. 440 —Severe bilateral ingrowing nail.

Occasionally the infection may extend backward producing a superficial infection of the dorsum of the toe (Fig 441)

Diagnosis.—Only rarely do melanotic tumors simulate this condition. In the vast majority of cases the diagnosis is made by the patient.

Treatment.—As palliative treatment a pledget of cotton saturated in 2 per cent yellow oxide of mercury may be pushed between the border of the nail and the granulating area The edge

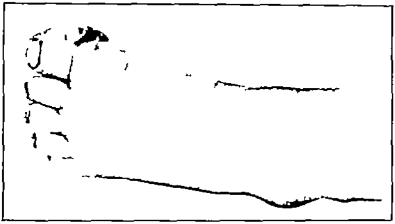


Fig. 441.—Infection of the dorsum of the great toe due to infection of the nail bed.

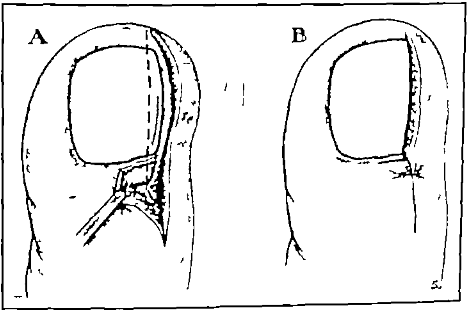


Fig. 442.—Operative treatment of ingrowing nail. *A* Shows the extent of tissue removed at the base of the nail. *B* Shows a suture placed to control bleeding and to lessen the area to be healed in by granulation.

of the nail must be trimmed off if it bores into the skin. If the lesion is not pronounced, these measures, supplemented by shoes broad across the toes may secure permanent relief Generally speaking the edge of the nail must be removed before definite

relief can be expected The operation is done in this wise After the area has been infiltrated with novocaine adrenalin the edge of the nail and the adjacent soft parts are cut away making sure that the nail bed at the root is removed At the same time it should not be extended so far proximalward that the joint is in danger of becoming infected (Figs 442 and 443)

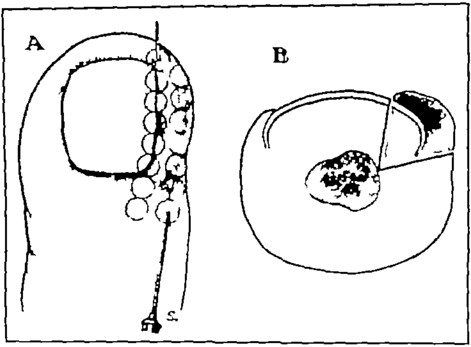


Fig. 442.—Operative removal of ingrowing nail. *A* The soft parts are infiltrated with novocaine. *B* Shows the extent of the tissue resected.

Köhler s Disease

Not infrequently in children between the ages of two and six a condition of painful foot develops without apparent deformity or apparent cause Usually the pain is referred to the instep but may be referred to the knee or even to the hip Sometimes there is a previous injury or infection There may be local tenderness but even this may be absent

Diagnosis—Tuberculosis is often suspected The joints are free and none of the spasticities associated with tuberculosis are present. Finally the x ray appearance is pathognomonic. An atrophy of one of the metatarsal bones usually the scaphoid, is noted (Fig 444.)

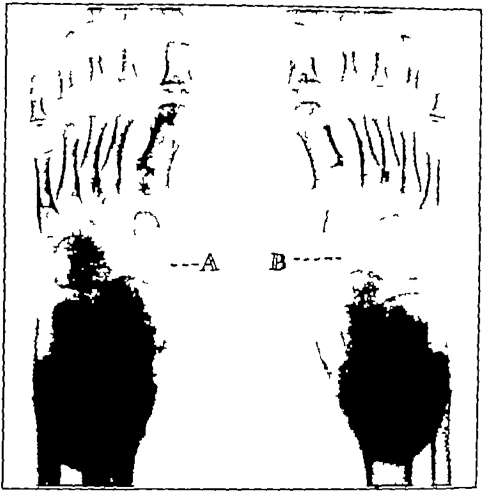


Fig. 444.—Köhler's disease showing the atrophy of the scaphoid bones *A* and *B*

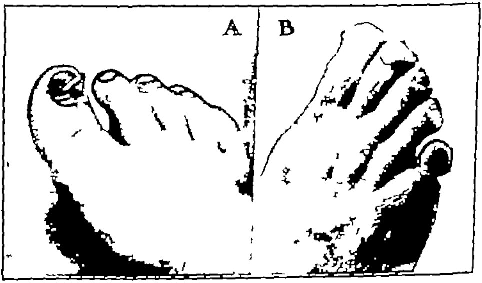


Fig. 445.—Unusual condition of the toes. *A*. So-called subungual exostosis. *B* Ainhum.

Treatment.—The disease is recovered from spontaneously. Supporting the instep by means of adhesive strips adds materially to the comfort of the individual. It is important to enhance the general health in every way possible.

Subungual Exostosis

Occasionally a bony lesion develops beneath the nail of the great toe elevating it (Fig. 441, 1). The exact nature of the tumor mass is in question. Save for the deformity they are innocent. They may be removed by means of a small chisel.

Ainhum

This curious affection consists in the gradual formation of a constriction about the little toe (Fig. 44, B). This constriction continues to deepen until the end of the toe drops off. No cause is known. The appearance is quite characteristic. No treatment is required except perhaps to hasten efforts at amputation.

CHAPTER XXI

INFLAMMATORY CONDITIONS OF THE LOWER EXTREMITY

The chief inflammatory conditions of the leg result from injuries These are usually perforating as from a nail or crushing, as from the falling of a weight Abrasions, burns and frost bites are less common sources of infections Of the chronic inflammatory conditions tuberculosis and syphilis are the common ones, though sporotrichosis and actinomycosis are occasionally encountered Chronic inflammations, such as chilblains and bunions and the ubiquitous varicose ulcers form a large part of ambulant surgical practice

INFECTIONS

Infections of the foot are not so frequent or so important as those of the hand but because objects causing the injury are often associated with the soil they attain a new importance, namely the danger of tetanus. Deep infections of the foot are *by no means rare* and when they are encountered are matters of great concern because their topography is by no means so definite as those of the hand

Superficial Infections

As elsewhere on the body superficial infections are common The superficial staphylococcic infections may appear as an ordinary boil as sluggish circumscribed infections (Fig 446) or superficial ulcerating lesions (Fig 447) or a localized granulating elevated lesion (Fig 448) the so-called granuloma pyogenicum.

Diagnosis —*The chronicity differentiates* them from acute infections The localized form differs from boils because of their slow development and slight tendency to break down. The ulcerous processes must be differentiated from syphilis and tuberculosis. They do not have the kidney shape of syphilitic ulcers,

and the surface of the adjacent skin is more or less eroded Tuberculosis is slow of development and the edges of the ulcers are undermined The granulomatous areas are elevated above the surrounding tissue and tend to bleed when irritated X ray burns may simulate these lesions (Fig 449)

Treatment.—The localized lesions should be incised and the interior curetted and cauterized with a chemical disinfectant the best of which is carbolic acid and tincture of iodine equal parts The superficial form is quickly cured by the application of 2 to 5 per cent ammoniated mercury ointment The granulomatous type should be excised or destroyed by the electrocautery

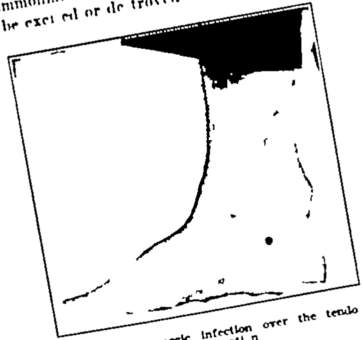


Fig. 448.—Superficial staphylococcic infection over the tendo achillis. Four weeks durati n

Local Infections

The most common and serious local infection is due to a perforating wound of the sole as from a nail thorn or piece of glass (Fig 450) When the infection is superficial to the plantar fascia a superficial abscess is produced which soon manifests itself as a red elevated lesion When the infection is carried beneath the plantar fascia there is severe deep-seated pain followed by a diffuse swelling of the entire foot The normal contour of the sole is obliterated and the dorsum of the foot becomes edematous. Fever and leucocytosis may reach a considerable degree In children the reaction may lead even to convulsions.



Fig. 447.—Superficial staphylococcic infection. Nine months duration.



Fig. 448.—Granuloma pyogenicum of three months duration.

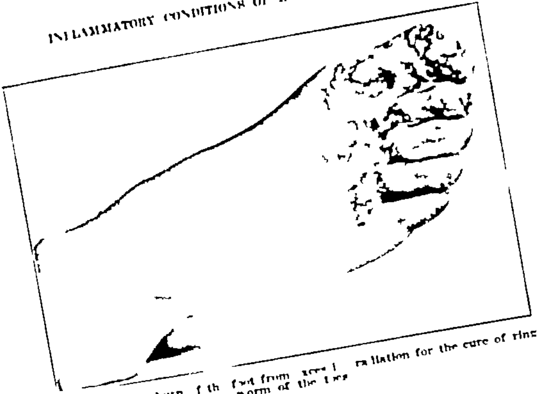


Fig. 449 —X ray burn f th f**t from xce l ra liation for the cure of ring worm of the t e

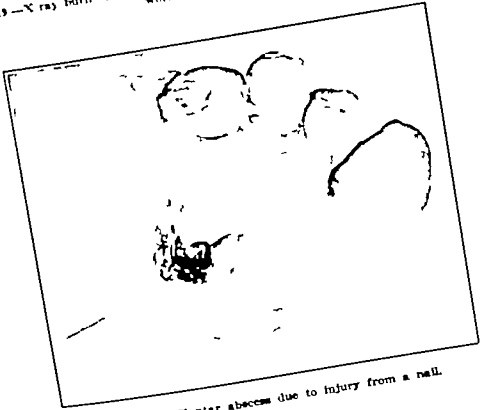


Fig. 450 —Plantar abscess due to injury from a nail.

If not relieved, the swelling may become enormous with wide destruction of the soft part and extensive necrosis of bone.

Diagnosis—The superficial infections are not attended by swelling of the entire foot There is seldom fever or pronounced leucocytosis The pronounced edema of the entire foot is characteristic of the deep infections

Treatment.—The chief factor is prevention, early disinfection and if need be, an adequate extension of the wound to admit of extensive chemical cauterization along with this a prophylactic administration of tetanus antitoxin. (See section on Injuries of the Foot.) Superficial infections if they are due to open wounds and are draining freely, may be managed by hot packs with plain water, boric acid solution or weak formalin solution If due to punctured wounds the opening must be enlarged. If the infection is a deep one particularly in those situated below the plantar fascia with pronounced swelling of the foot it must be incised as far as the infection extends.

Lymphangitis

Inflammation of the afferent lymphatics of the lower extremity usually have their origin in some slight wound, frequently an abrasion about the toes or the dorsum of the foot The wound usually is sluggish, slightly reddened about the margin, showing a small amount of slightly clouded thin serum The local discomfort is not great. Extending from such a wound a slight red streak is seen to extend up the calf and in some instances may be traced to near Poupart s ligament The reddened area may be slightly sensitive to pressure and there may be some edema in the tissues about it, but only in the more pronounced infections is there extensive edema The inguinal lymphatics are enlarged and tender Those glands situated below the ligament are first involved. In mild cases the infection is confined to them In severe cases other gland groups may become secondarily involved. Associated with these local symptoms there is more or less constitutional disturbance slight fever usually 100 to 102 degrees and sometimes a slight chill announces the advent of the infection There is usually a general malaise and often generalized pain. In severe infections the general distributions may be profound

Diagnosis.—Sporotrichosis sometimes resembles it. Though much less common than in the arm, sporotrichosis is sometimes seen in the lower extremity (Fig. 451). As in the arm it appears as a series of deep-seated inflammatory lesions along the line of the lymphatics. The advent of lymphangitis may be anticipated in some instances by the discovery of a small wound of the type above mentioned complicated by inflammation of the inguinal lymph nodes. Erythema nodosum (Fig. 452) and even bromide eruption (Fig. 453) have been mistaken for lymphangitis.

Treatment.—Local disinfection of the wound, absolute rest in bed with elevation of the affected leg and the application of wet

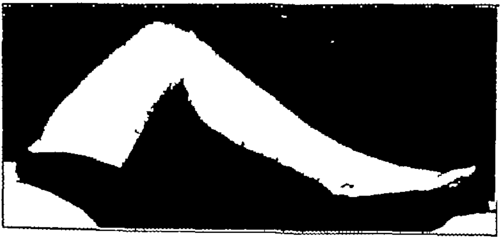


Fig. 451.—Sporotrichosis of the leg following a slight injury to the dorsum of the foot. The lesions were deeply seated and appeared as dark red, indurated areas within the skin.

packs constitute the treatment. If areas of suppuration occur either along the line of the lymph vessels or in the lymph nodes drainage must be instituted.

Lymphadenitis

Lymphadenitis is an infection of the lymph nodes, usually the group in the inguinal region. The portal of entry of the infection may be an infected wound anywhere along the extremity, buttock, penis, scrotum or anal region. It may complicate a gonorrhea, chancre or chancroid.

In the type produced by the ordinary pus organism at first there is usually noticed an enlargement of the lymph nodes in

the form of discrete tender kernels Later the surrounding inflammatory reaction obscures the lymph nodes themselves (Fig 454) The constitutional symptoms are not marked as a rule A slight fever and malaise are about the only manifestations. The infection may subside or the nodes may break down and suppurate Fluctuation may be felt late and the abscess may point, open spontaneously and drain.

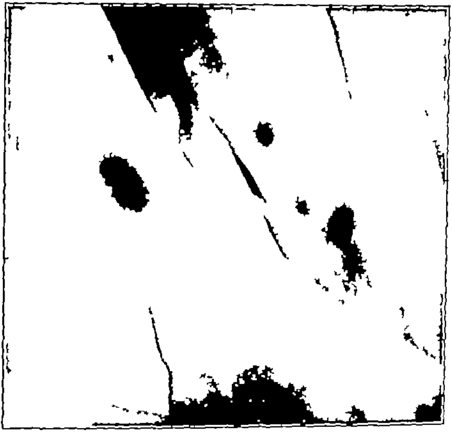


Fig 452.—Erythema nodosum in a woman aged forty-six years.

When the lymphadenitis is caused by the gonococcus it constitutes the so-called bubo Gonococcus lymphadenitis is differentiated by the history of infection and finding of gonococci in the urethral smear

Syphilis causes a lymphadenitis especially during the existence of the primary sore The lymph nodes are discrete there is little *inflammatory reaction in* the surrounding tissues the nodes do not break down and suppurate unless secondary infection is present in the chancre and the *chancre can usually* be located.

A chancroidal infection very frequently causes a suppurating inguinal lymphadenitis and the primary lesion can always be found



Fig. 43.—Bromide eruption in a woman aged forty years.

Diagnosis—The diagnosis is made by determining that it is the lymph glands which are involved and then finding the source of infection Early in the disease the glands may be readily outlined by palpation but after the inflammation extends beyond the glands, other conditions must be taken into account. Ab-

scesses extending from the pelvis or iliac cavity may point here and possible courses for such a state must be sought by examination of the spine and pelvic cavity Strangulated hernia is often confused The more sudden onset of hernia should guard against this error The findings of the source of the infection is facilitated by remembering that it is the glands below Poupart s ligament that drain the leg and those above the ligament that receive the drainage from the pelvis perineal region and the genitals

Other causes of lymph gland enlargement must be kept in

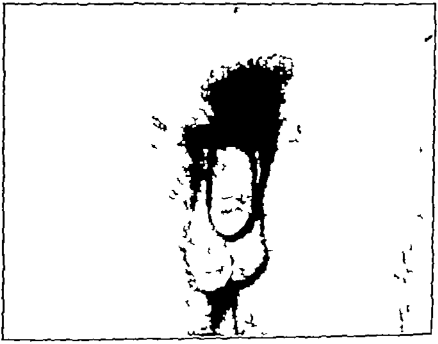


Fig. 464.—Right inguinal lymphadenitis following injury of the foot.

mind. Tuberculosis of the lymph nodes of the inguinal region is not common and the chronicity of the process would usually differentiate it from a suppurative process Hodgkin's disease can be ruled out because the nodes are large and discrete without inflammatory reaction and the finding of similar nodes elsewhere gives additional evidence The absence of any etiologic factor would point to a neoplastic origin. Sarcoma and carcinoma are secondary to disease elsewhere and can be diagnosed by finding the primary lesion If primary the absence of an etiologic factor and the noninflammatory character would stamp them as neoplastic Melanoblastomas of the foot are sometimes

overlooked and the enlarged lymph nodes are regarded as inflammatory and are incised causing chagrin to the surgeon and disaster to the patient

Treatment.—The treatment of lymphadenitis if seen early, is rest in bed with an ice pack over the infected nodes The original focus of infection should be treated A suppurating lesion should be opened and drained or a gonorrheal or chancroid should receive appropriate treatment Many cases will not go on to suppuration If the infection is progressive in spite of treatment moist heat will allay the pain better than ice packs If the area remains indurated and red in spite of treatment it should be opened by incising the skin and separating the tissues with a hemostat Several areas of fluctuation may appear and it is necessary to thoroughly open all of them After incision hot moist packs hasten separation of the necrotic tissue Block dissection of the infected nodes hastens healing but it is a major operation and is not to be undertaken lightly

Cellulitis

A cellulitis of the lower extremities is the same as in the hand a diffuse spreading infection of the fascial planes It is less prone than in the hand to follow definite tendon sheaths and soon ceases to be a suppurative tenosynovitis and becomes diffuse following the fascial planes and invades the cellular spaces The numerous joint cavities of the foot are prone to become infected which adds much to the gravity of the affection It may start from any infected wound usually a small insignificant one, infected insect bites or infection around the nails but quite as often follows deeply penetrating wounds.

The first sign is a hard brawny swelling of the parts red at first, later becoming a bluish red color The entire foot becomes swelled the plantar arch is obliterated the dorsal lines are lost and the toes stand apart The whole foot is tense shiny and feels hot In severe cases bullae may appear which are filled with a seropus Areas of fluctuation may appear particularly about the toes or about the ankle joint The heavy plantar fascia prevents the appearance of fluctuation at the point of maximum infection The pain which at first is severe may give way to a numbness when the pressure is sufficient The constitutional

symptoms are often severe. There may be chills and fever rapid pulse is usually present. The fever may reach 104 severe cases and prostration may be great. Abscesses may spontaneously or the patient may die of sepsis before any tuation appears.

Diagnosis—Because of the depth of the infection its gra is apt to be underestimated The constitutional symptoms a better guide to the condition than the local findings. If the any doubt an incision is in order

Treatment.—Wide incision should be made in the affe parts The greatest source of error is on the side of too s incisions. The incision should be longitudinal to avoid as n as possible injuring tendons and nerves The infected ca should be explored with the fingers and incisions should wide open all infected pockets When widely separated cou drains may be used The incision should be packed open hot moist dressings applied. These should be kept moist A the spread of the infection is definitely limited wet dressings be discontinued and vaseline gauze dressings applied

Entrance into the joints should be avoided unless they are seat of suppuration. The incision should avoid as far as pos the weight bearing surfaces of the foot lest the resulting cause pain when trod upon The dorsum is prone to bec enormously edematous but should not be incised unless ac suppuration is present Once the infected area has been fr incised the wound should be packed and the foot placed i hot pack. Amputation is done far too often for infection I a question whether it is ever justified in the absence of gangr Wide and numerous incisions will control the infections I surprising to what extent recovery is possible and how usef member can be secured in the most extensive infections T is particularly true in young persons in whom the blood res are unimpaired.

Abscesses

An abscess of the lower extremity may occur on any part often the portal of entry may not be apparent though man the infection gains entrance to the tissues through punctu wounds. It may start in the subcutaneous tissue or under fascia particularly under the fascia lata The symptoms

pain swelling redness and tenderness to pressure over the affected part If the abscess is subcutaneous the swelling is more

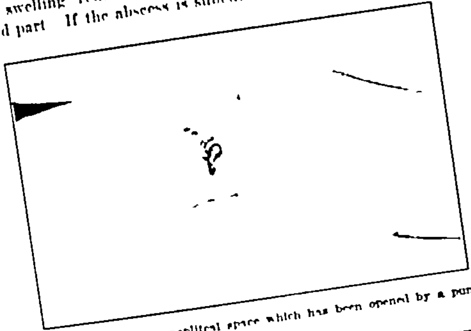


Fig. 455.—Abscess of the popliteal space which has been opened by a puncture

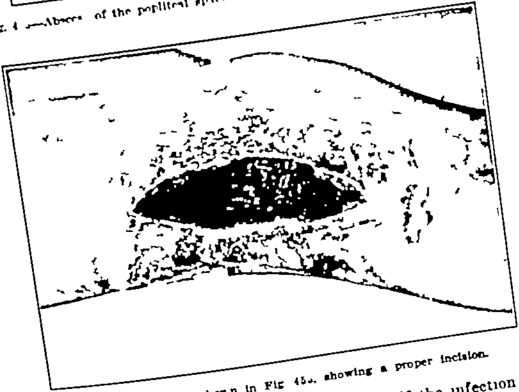


Fig. 456.—Patient shown in Fig 455, showing a proper incision.

likely to be localized and is early apparent If the infection is under the fascia lata the whole region will become swollen and

sensitive to pressure Fluctuation may not become apparent until late in the disease. Sometimes subcutaneous edema marks the site of the deep suppuration (Fig 455)

Diagnosis.—A localized pain and redness are distinctive in the superficial type In the deep type the pain may be generalized The deep abscesses of the thigh may cause pain throughout the extent of the great sciatic nerve and are consequently long treated as neuralgia of that nerve Tenderness, swelling and constitutional disturbance should prevent this confusion.

Treatment.—If a fluctuating point is found, this of course, is the logical point for incision. If the infection is deep, the incision should be made over the spot of greatest tenderness which is usually in the region of the primary wound if there be such. It is always best whenever possible to make incisions parallel with tendons and as far away from them as possible Such abscesses should be freely drained (Fig 456)

Thrombophlebitis

This term infers an inflammatory condition in the wall of a vein which is followed by a thrombosis in this part of the vessel Two types may be distinguished The first type begins either in the pampiniform plexus or in the iliac or femoral veins. The other occurs in varicose veins usually in the calf and may or may not be associated with varicose ulcer The one may be called central, the other peripheral.

Central Thrombophlebitis

Thrombophlebitis of the lower extremity occurs in association with abdominal or pelvic operations parturition typhoid fever or other infectious diseases More rarely a thrombophlebitis occurs which is apparently an independent condition without any antecedent disease.

Thrombosis following operation usually occurs about the tenth to the fourteenth day after operation and usually affects the left leg The onset of pain is preceded by a slight rise of temperature which cannot be accounted for The onset of pain is usually rather sudden and is very severe. Edema of the leg and foot usually do not appear for twenty four hours later The

temperature may go as high as 103 The severe pain does not last more than two days as a rule The temperature generally subsides gradually, reaching normal in about ten to twelve days The thrombosis affects the long saphenous and femoral veins The vein may be felt as a hard cord tender to pressure The edema of the foot and leg usually last for six months to a year or more, being aggravated whenever the patient is on his feet In some cases the circulation is never completely restored and a little edema is always present when the patient is on his feet Chronic ulcers may result

Diagnosis—The fever attended by pain in the leg with swelling is characteristic When the veins are palpable the diagnosis is certain

Treatment—The treatment consists of rest in bed elevation of the leg and foot on pillows, the application of heat to the leg and the giving of morphine or codeine during the stage of severe pain. Massage must be interdicted entirely as there is danger of loosening a thrombosis with resulting fatal embolism After ten or twelve days if the temperature is normal the patient may be allowed out of bed The extremity should be snugly bandaged from the toes to the knees or an elastic stocking may be worn until the edema disappears.

Peripheral Thrombophlebitis

This type frequently occurs in varicose veins of the leg (Fig 457) as the result of injury to the veins or from infection entering through a varicose ulcer The symptoms are localized swelling along the course of the vein Usually the vein may be palpated as a hard cord but this may be obscured by an associated cellulitis The swollen area is red and tender to the touch Fever may be present and suppuration may occur and produce a local abscess or the clot may ulcerate through the skin and cause a severe and even fatal hemorrhage

Diagnosis—If the dilated vein can be outlined and palpation shows it to be firm, the diagnosis is made If there is diffuse inflammation and there are dilated veins bordering it, there is but little doubt as to the nature of the trouble

Treatment.—As a palliative measure during the inflammatory stage, hot packs of 5 per cent aluminum acetate relieve the

pain After the acute pain is relieved a 10 per cent ichthyol oint ment may be applied and the part covered with dressing and bandaged Massage or other manipulation should be avoided lest a clot be liberated with disastrous consequences If suppuration should occur the abscess should be drained. If a clot ulcerates through and hemorrhage occurs, a gauze pack and a tight bandage may be used to temporarily check the hemor rhage As soon as possible all the varicose veins should be ex tirpated The saphenous should be ligated high up and the in flamed area approached from above downward The entire thrombosed area together with the indurated perivascular tissue should be removed

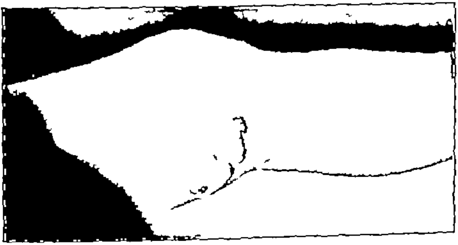


Fig. 457.—Thrombophlebitis in the popliteal region.

Gangrene

The foot is the most common site of gangrene Several groups may be distinguished the moist which follows trauma of the foot the diabetic, and the senile To these may be added the rarer conditions of gangrene thromboangiitis obliterans Most of these cases come as ambulant patients and their early recog nition with appropriate prognosis is important to the attendant s reputation and peace of mind

Traumatic Gangrene

Any trauma which destroys the circulation of the foot particu larly the venous return may lead to gangrene Trauma and ex posure (Fig 458) are the common causes This may occur either



Fig 458.—Gangrene in an old man, following xposure to w t and cold.

with or without infection When a leg is run over by a heavy vehicle, particularly by a flanged wheel, cooling of the extremity is the first indication of a faulty damaged circulation. The affected parts become cold and bluish and may be painful Usually swelling is extreme. In the beginning the diseased area shades gradually into the normal tissue above As the area of disturbed nutrition becomes limited by the defensive forces above, a line of *demarcation becomes manifest* *Injury to the popliteal vein is* the most familiar example and commonly leads to gangrene of the foot. Whenever there is an injury to the popliteal space therefore this condition should be expected

Diagnosis.—If following exposure to wet and cold the foot becomes cold and blebs form, impending gangrene should be strongly suspected Likewise after injury to the veins of the calf or popliteal veins when the foot becomes swollen, painful and bluish gangrene may be predicted

Treatment.—When this condition is suspected following exposure the leg must be dressed aseptically kept warm, and elevated with the hope of staying the process In injuries in addition to these measures the foot should be kept elevated. If *prophylactic measures fail amputation is* done. The point of injury is decided by the type of injury In those cases following exposure or trauma of the popliteal veins amputation should be done above the knee. In lesser injuries the degree of involvement of the gangrene and the site of injury must determine the extent of sacrifice

Infectious Gangrene

Even inconsequential injuries may be followed by gangrene. There is a diffuse infection involving the muscles and other soft parts. The limb becomes swollen and boggy and after a few days becomes blue or bluish black. When the infecting organism is the gas bacillus the swollen area crepitates The first evidence of gangrene may be at some distance from the site of injury

Diagnosis.—Wounds that are quickly followed by diffuse swelling should be regarded with suspicion Once black spots or crepitation appear the diagnosis is made



Fig. 459 —Beginning gangrene of the second toe The fourth and fifth toes have been amputated for a like condition.

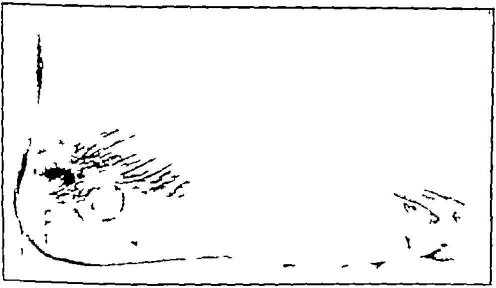


Fig. 460 —Diabetic gangrene on the side of the heel.

Treatment.—Early local antiseptic treatment of the wound is in order Once gangrene appears wide incision at least and generally amputation is in order

Diabetic Gangrene

In the course of severe diabetes any indifferent abrasion about the toes or feet may lead to gangrene It usually begins as an

ulceration about the nail (Fig 459), but may begin in other situations (Fig 460) The area becomes black and painful. Usually the affected area becomes dry and shades without sharp demarcation into the reddened skin above After a time a line of demarcation may form but the process may gradually extend up the leg

Diagnosis—If a wound of the foot does not heal, diabetes should always be suspected If gangrene begins in the presence of diabetes the diagnosis is certain.

Treatment.—In diabetes the slightest injury should receive careful treatment In trimming nails great care is necessary lest



Fig 461.—Senile gangrene of the second toe.

slight injury be produced leading to infection Once gangrene begins, the affected parts should be carefully cleansed and put up in dry antiseptic dressings The diabetic state should be intensively treated Under favorable conditions the wound may heal If the gangrene spreads despite this care amputation must be done Usually thrombosis extends to the popliteal veins and amputation below the lower third of the thigh is apt to end in failure

Senile Gangrene

This type of gangrene occurs as the name indicates in the aged Usually without cause a toe becomes pale and cold After some weeks it becomes black and mummifies (Fig 461) If the process is rapid, the pain may be extreme The slowly developing types are but little painful The mummification may progress gradually until the dead toe actually drops off The process gradually extends up to the calf to the knee (Fig 462) Usually there is a thrombosis in the popliteal vessels Extreme pain may appear early Sometimes the gangrenous process shows first along the borders of the sole of the foot or even above the ankle

Diagnosis.—When the aged complain of pain in the foot the entire leg should be inspected for possible gangrene If one or more toes appear cold and blue the diagnosis is likely If the tibial artery does not pulsate the probability is heightened If the toe becomes black the diagnosis is certain

Treatment.—When the early symptoms appear elevation of the foot may give some relief Plunging the foot alternately into cold water then into water as hot as can b borne has been recom mended Amputation is the only cure but in the aged and decrepit antiseptic powder dressings may be used in the antici pation that other maladies may overtake the gangrenous process. Amputation occasionally can be done below the knee with suc cess but usually the point of election is the lower third of the thigh

Thromboangiitis Obliterans

This condition is characterized by severe pain in the foot with blanching and coldness of the extremity followed by gangrene It is seen almost entirely in young persons Often there is inter mittent pain and cramps in the calf long before there is evidence of circulatory disturbance in the toes Sooner or later the toes become bluish or reddish and cold This condition may remit but inevitably gangrene begins and the pain and disability are constant. Pulsation in the tibial artery is lost

Diagnosis.—The insidious onset of the gangrene in a young individual is diagnostic Care must be exercised lest other causes for the pain may be hypothecated such as sciatica or flatfoot. The pain is more intense than in the latter and is not lancinating



Fig. 462.—Diffuse dry gangrene of the foot beginning at the border of the sole and above the ankle.

as in the former; the point of tenderness in the hip characteristic of sciatica is lacking Lack of pulsation in the dorsalis pedis artery is suggestive

Treatment.—Elevation of the foot may give some relief In early cases bathing the affected foot alternately in very hot water

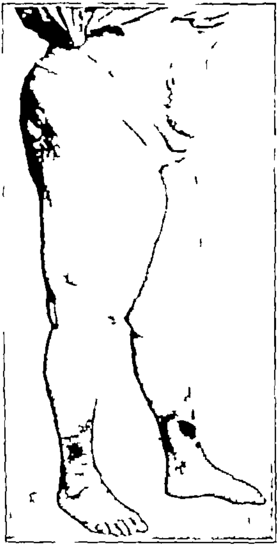


Fig. 163 —Varicose ulcer of the leg following phlegmasia alba dolens twelve years before.

for five minutes and then changing to cold water for the same length of time affords relief This is repeated a number of times, usually three making a total of thirty minutes This series is repeated once or twice a day Sooner or later amputation becomes necessary Amputation of single toes gives little relief

from pain and but postpones the day when amputation at least as high as the upper third of the calf will be demanded.

Varicose Veins

Dilated veins of the leg may result from a thrombophlebitis in the upper terminal of the leg veins, which may be called the in

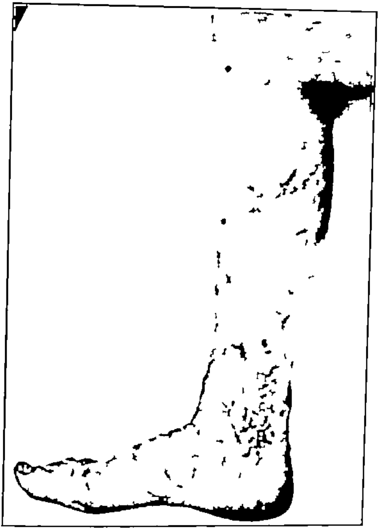


Fig 464 —Pronounced varicose veins of the leg.

flammatory type or from weakness of the vein walls which dilate from disturbance in the return flow as in pregnancy or by constant standing There results a dilatation of the veins often with ulcer formation. This may be called the static type. In the first variety the veins are usually not permanent but may be

so (Fig. 463). In the latter variety the vessels are prominent and may appear as knotted cords (Fig. 464).

Diagnosis.—It is important to distinguish between the two varieties. Usually besides the absence of large veins in the first type there is a history of the trouble beginning in childbed or following some acute fever. It is usually unilateral. The *second* type shows prominent tortuous veins, the history of having come on gradually, and it is usually bilateral.

Treatment.—The edema may be helped by bandaging. The type preceded by thrombophlebitis is made worse by operation

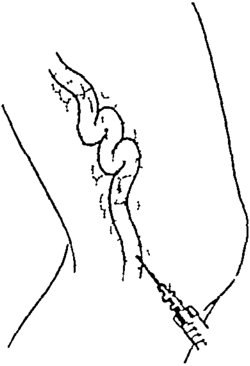


Fig. 465.—Infiltration of skin over a varicose vein.

because the deep veins are obliterated. The static is cured by operation. The technic is as follows.

The location of the chief offending vessels can be determined when the patient is on her feet. The skin over the vein is infiltrated in the usual manner (Fig. 465). The skin above and below the vein can be infiltrated by sliding the skin first on one side and then on the other. For this purpose a considerable amount of weak solution, ¼ per cent or less, is used in order to facilitate the dissection of the veins. The vein should be dissected in plain sight so that collaterals may be seen before they

Ulcers when formed may remain stationary for years They may become large enough to almost encircle the extremity They may heal completely spontaneously and then break down again During the stage of healing they may be covered with healthy,



Fig 466—Chronic ulcer of leg following typhoid fever ten years ago.

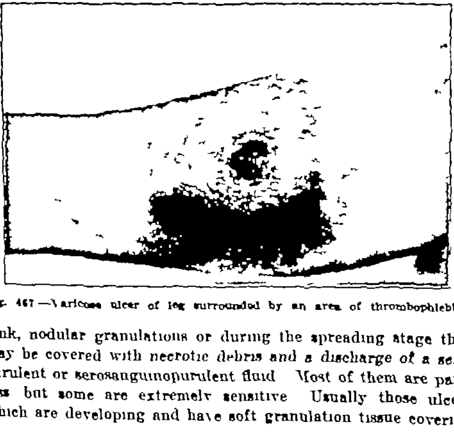


Fig. 467—Varicose ulcer of leg surrounded by an area of thrombophlebitis.

pink, nodular granulations or during the spreading stage they may be covered with necrotic debris and a discharge of a seropurulent or serosanguinopurulent fluid Most of them are painless but some are extremely sensitive Usually those ulcers which are developing and have soft granulation tissue covering

them are painless, while the chronic ones covered by firm granules and surrounded with a dense cicatrized border are painful on pressure (Fig 466) The tissue around the ulcer frequently shows an inflammatory reaction (Fig 467), and some are surrounded by an area of eczema (Fig 468) the itching of which causes the patient



Fig 468 —Chronic varicose ulcers of the leg complicated by eczema.

much more discomfort than the ulcer itself The discharge from the ulcer unless the dressings are frequently changed is very foul smelling The skin around the ulcerated area frequently shows a brown pigmentation

Varicose ulcers develop slowly and show little tendency to heal

They gradually extend or as gradually heal Frequently however they remain for many years

Diagnosis.—The chief problem in the diagnosis is the determination of the predisposing cause of the ulcer The form and chronicity are suggestive and if there is a history of thrombophlebitis following an acute disease or there are dilated veins in the neighborhood the diagnosis is easy One has to remember other possibilities however Syphilis and tuberculosis must be thought of whenever an ulcer is examined and this rule holds here Syphilitic ulcers are often distinguished by their deep punched-out appearance and their tendency to occur as a kidney shaped ulcer Syphilitic ulcers are usually situated on the lateral surface of the leg while varicose ulcers are usually situated on the medial side Tuberculous ulcers generally have soft overhanging borders and are usually seen in young patients

The prognosis is not usually good Healing is extremely slow and frequently ulcers which heal break down again With much patience and implicit carrying out of the principles of treatment good results are frequently attained

Treatment.—Rest in bed with elevation of the extremity improves the circulation and is almost necessary to bring about a cure If there is a constitutional disease which predisposes to the condition this, of course should receive appropriate treatment The nutrition and general health of the patient should receive attention.

If a patient with varicose ulcer cannot be placed in bed for treatment the best treatment is the use of the gelatin paint cast It is made as follows Gelatin 5 parts oxide of zinc 5 parts boric acid 1 part glycerin 8 parts and water 6 parts are heated in an ordinary double boiler or in a water bath until they form a liquid mixture An ordinary gauze bandage 3 inches wide is rerolled loosely and soaked in this hot solution When the bandage is thoroughly saturated it should be quickly applied to the leg from the toes to the knee before it has time to cool. It should fit snugly Two layers of this should be applied and then an ordinary gauze bandage If there is little discharge from the ulcer it may be covered with the paint bandage the whole being renewed but once a week If the discharge is great an opening

must be cut to drain the ulcer After healing, an elastic bandage or stocking should be worn *continuously*

All palliative treatments are little satisfactory in the end. It is *preferable to excise the ulcer and graft skin onto the defect.* In static ulcers the veins should be removed as well The cure will be permanent. In the thrombophlebitic variety the *grafts* sometimes fail and the veins should by no means be excised. Excision of the veins in this type but increases the difficulty

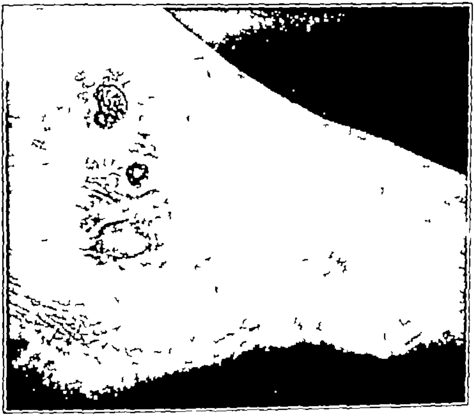


Fig 469 —Tuberculosis of the ankle.

Tuberculous Ulcers

Tuberculous ulcers are not rare on the lower extremity particularly about the ankle. *They develop slowly beginning* as deep red or bluish elevations which after a time break down *forming superficial ulcers* with soft overhanging borders (Fig 469) They cause little pain and annoy chiefly by the exudate they produce These patients are usually below par and not infrequently have tuberculous lesions elsewhere

Diagnosis—The peculiar color and slow development are characteristic They are not attended by induration characteristic of varicose ulcers and they develop more slowly than syphilitic ulcers and lack the peculiar form of ulcers of that disease

Treatment.—General tonic measures usually prescribed for patients with this disease are in order Local application of balsam

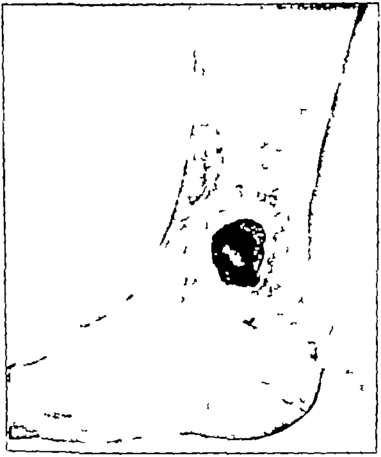


Fig 470 —Irritable ulcer of the malleolus

of Peru is useful but the injection of iodoform glycerin 5 per cent, about and under them is the most efficient measure

Irritable Ulcer of the Malleolus

Similar in location but quite different from the preceding are the painful ulcers They are characterized by firm borders (Fig 470) not undermined and with small epithelial protuberances here and there about the border (compare Fig 466)

Diagnosis.—From syphilis and tuberculosis they are easily differentiated by their soft border. Whether they differ from chronic varicose ulcer I do not know.

Treatment.—Corlette advises passing a knife through healthy tissue above the ulcer severing all the tissues from immediately beneath the skin down to the periosteum. Excision with skin grafting likewise disposes of them.

Syphilitic Ulcers

The lateral surface of the tibial region, about the knee and the upper thigh and particularly the lateral surface of the calf (Fig. 471) are the most common sites of this lesion (Fig. 472). They



Fig. 471.—Syphilitic ulcer of the lateral surface of the calf.

form punched-out ulcers with fairly sharp edges. They are typically reniform. They develop within six to ten weeks usually and are painless unless the periosteum is involved. In that event there are intense nocturnal pains.

Diagnosis.—Their rapid development and peculiar form are characteristic. That they are usually located on the lateral surface of the leg has already been mentioned. Occasionally pyogenic (Fig. 473) ulcers may simulate syphilitic ulcers very closely. They are more spherical and they do not respond to antisyphilitic treatment. Finally the therapeutic test may be applied as a final proof.

Treatment.—Mercurial ointment locally and potassium iodide internally cause them to disappear in a few weeks. After that measures may be applied to the cure of the disease.



Fig. 4.—Gummatous ulcers of the knee.

Perforating Ulcer of the Foot

The predisposing causes of this condition of the foot are diabetes, nephritis, syphilis or some central or peripheral nerve lesion. A slight trauma and infection cause a suppuration under the callus which when removed exposes an ulcer which may penetrate to the bone. In occult spina bifida perforating ulcers are sometimes the first clue to the existence of this condition. The usual sites for the ulcer are the bottom of the toes, under the metatarsophalangeal articulation of the great and little toes

and heel After the initial discharge of pus there is very little discharge and the ulcer is painless

Diagnosis —The slow onset, the sluggish course and painlessness suggest the diagnosis Early melanotic ulcers must be kept in mind

Treatment.—Rest in bed with adequate treatment of the predisposing cause are the chief measures. Locally the ulcer should be kept clean and the callus around it removed by the application of a 10 per cent salicylic acid ointment and soaking the foot in a hot water bath after which the callus is easily scraped off The



Fig 4 3—Pyogenic ulcers of the lateral surface of the calf

ulcer should then be packed with gauze soaked in balsam of Peru Occasionally radical excision is successful but usually all measures fail

Sciatica

Sciatica may be defined as a painful affection of the sciatic nerve Whether it is a neuralgia or a neuritis is immaterial for this discussion It has nothing to do however with the sacroiliac articulation as some orthopedists would have us believe

The disease begins usually as a dull pain in the lumbar region or sometimes as a typical lumbago but more commonly in the

lower gluteal region Following this premonitory discomfort, definite pains extend down the course of the sciatic nerve The pains may be boring burning or even lancinating, and of extreme intensity Occasionally the onset is rapid the initial symptom being sharp shooting pains extending down the nerve The pains follow accurately the course of the sciatic nerve The points of greatest intensity are usually at the sacrosciatic notch in the popliteal space and occasionally down the calf in the line of the peroneal and tibial nerves These points also represent the areas of greatest tenderness These pains may be continuous but are usually intermittent They are often worse at night or after exposure to cold To this clinical picture may be added the classical test of extending the leg on the flexed thigh. The stretching of the nerve by this manipulation increases the pain This test is less reliable than simple palpation along the course of the nerve The scoliosis which sometimes accompanies sciatica is indicative only of a severe and long standing disease and may be ignored in the treatment When the pain is relieved the spine assumes its normal position

Diagnosis—Though the diagnosis is nearly always easy yet it is possible to make a mistake Diabetes must always be considered, particularly if the affection is alternating or bilateral If there are definite atrophies, paralysis, or anesthesias a neurologist should be consulted In diseases of the hip joint pain may extend down the leg but it is usually not so marked in the line of the sciatic nerve and the points sensitive to pressure are absent Besides physical examination shows some limitation of movement and the x ray picture will show some bony changes. As a clinical entity sacroiliac subluxation particularly must be banished as visionary hypothetical and anatomically impossible

Treatment.—As palliative treatment rest in bed applications of heat and sedatives such as aspirin and pyramidon may be used. Potassium citrate a dram a day sometimes gives relief.

As curative treatment injections directly into the nerve trunk is most effective A solution of 1 per cent quinine and urea hydrochloride is used From 15 to 30 c c are injected into and about the nerve at the point where it lies over the neck of the femur This point is selected because when the neck of the

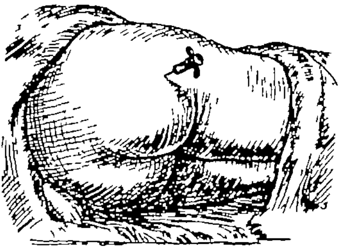


Fig 474.—Showing the position of the patient and the point of injection of the sciatic nerve.



Fig 475.—The relation of the sciatic nerve to the tuberosity of the ischium and the trochanter is shown. The dotted line shows the degree of forward displacement of the nerve when the thigh is flexed on the pelvis.

femur is reached by the point of the needle the operator knows the needle has been passed deeply enough and that if the nerve has not been located the direction of the needle must be changed.

The technic is as follows. The patient is placed on the unaffected side with the affected thigh half flexed. A point is selected on the line between the tuberosity of the ischium and the great trochanter (Fig. 474) somewhat lateral from the midpoint, the exact distance depending upon the size of the patient. When the patient stands erect the nerve passes over the edge of the acetabulum which is a point midway between the bony landmarks just mentioned (Fig. 475) but when the leg is semiflexed as above advised the nerve glides lateralward along the neck of the femur (see dotted line Fig. 475). It is at this point that the needle must strike it.

A wheal is first made in the skin with a fine needle. A larger needle long enough to reach the depth required (preferably one of 18 gauge and four or five inches long) is passed slightly upward as it goes into the depth. If it strikes the nerve the patient will feel a pain shooting down the leg along the line of his former pain. The operator will perceive a sensation as if the needle had passed from muscle into rubber tubing—a peculiar elastic resistance. If the nerve is not struck the needle will strike the neck of the femur. The operator must then partly withdraw the needle and start in a new direction. Usually he will find that his needle has passed too far medially. Patient search must be made until the nerve is located—by no means a simple matter particularly in stout patients. The solution to the amount indicated is deposited in this region. In thin subjects the lesser amount mentioned is proper and in stout patients and for repeated injections the larger amount is used. Five cubic centimeters of the solution should be injected directly into the substance of the nerve and the remainder in its immediate vicinity.

After the injection has been made the patient should be kept in bed a day or two. Recent or mild cases are usually cured by one injection. Severer cases should be reinjected after a week. Severe long standing cases, particularly those complicated by scoliosis, may require as many as four or five injections. The interval between the treatments should be a week or two.

If the injection is made into the nerve a cure is certain Usu ally the first injection produces a marked improvement In rare instances the condition seems to be aggravated by the first injec tion, but this passes off within a few days

The galvanic current as strong as the patient will bear one electrode over the ankle the other over the sacrosciatic notch gives excellent results when suitable apparatus is at hand. The treatment should be continued for twenty minutes and repeated every three or four days

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